THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. AUGUST 26, 1897. CHICAGO, ILL. NUMBER 34.

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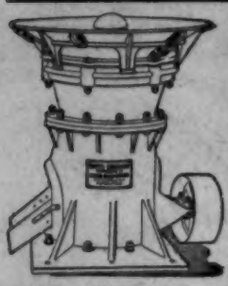

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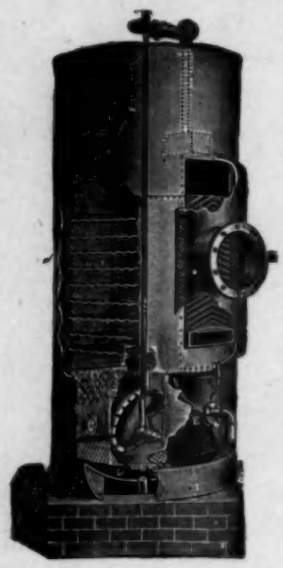

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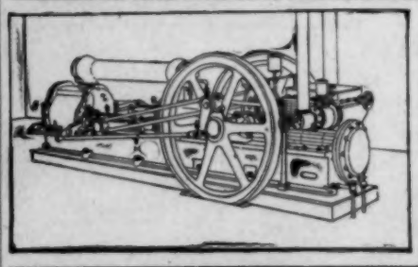

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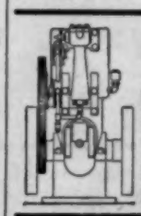

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. AUGUST 26, 1897. CHICAGO, ILL. NUMBER 34

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Next to the volume of business in iron and steel, which has kept up well through August, the confidence with which buyers make contracts, in contrast with the cautious, limited trading of the first half of the year, is an encouraging featue of the situation. It is the seller who draws the line on far future deliveries, since it is generally conceded that his is the risk of any long extension of to-day's prices. The advance to fuller employment of rolling mills and steel works is doubtless as rapid as should be expected. It is necessary to remember in the midst of the sensational advances in wheat, that the iron trade is ordinarily from six months to a year reaping the benefits of bountiful crops and good prices for them. The reports of car shortage are heard considerably earlier than usual this year, however, and Western car works are quite busy, while the Chicago district reports further contracts pending. Bar mills from Pittsburg west are quite well booked to-day and some of them will not need to hunt for business before the end of the year. Bessemer steel plants in Pittsburg and Chicago and the intermediate territory will likewise be well employed through the year, leaving out of the account prompt business that will come up in the fall months. Added to the crowded condition of the rail mills, is the accumulation of two months of heavy selling in billets, sheet and tin plate bars and wire rods. As was the case just before the opening of the year, after the billet pool broke, sales of the above intermediate products have been larger than could be gathered from week-to-week repotrs. Any general statement as to prices of finished prodcuts would be inexact, but the number of lines in which a hardening tendency appears is increasing. Buyers, it is to be presumed, are hunting as industriously as ever for weak sellers, but it is evident from the way in which quotations are being accepted that mills have been getting in more comfortable shape. Ordinary lots of structural material are from $1 to $2 a ton above the lowest prices, and 1.05c Pittsburg has been done on beams and channels. Sellers of steel bars are more nearly uniform on a 1c basis, Pittsburg, and sheets have been advanced $1 a ton by most mills. Wrought pipe manufacturers are together in a five per cent advance and quotatione are quite firmly held. In Central territory structural demand is good and bars and plates are quite active. Bridge works generally are better employes than in months. Bessemer pig iron maintains the better position of the past two weeks. For September delivery $9.25 valley furnace is minimum and furnaces are refusing that figure for deliveries to the end of the year. Some iron has sold at $9.50, valley furnace, for deliveries running from January to March. The Pittsburg market is $9.65 for 1897 and $9.90 for early 1898 delivery. A distinct advance has taken place in billets, sales at $14.75 delivered, Pittsburg, being reported. Wheeling district steel production is shortened by the coal strike and other Bessemer plants in the Central West are well sold up. Rods are quoted at $20 to $21.50, Pittsburg, and a good many buyers have sought to cover in the past two days. The market for foundry iron is steady, with fair activity. Deliveries are going forward in good volume on contracts and not a few buyers who supposed they had covered their wants to the end of the year now find that they must make fall purchases. The melt of foundry rons is evidently heavier than in the early months of the year.

THE CLEVELAND DISTRICT.

The iron ore sales of the past three weeks, aggregating probably 500,000 tons, are not the "enormous" totals indicated in the commercial reviews, but as they have taken up nearly all the old-range Bessemers available, the probability of a slight advance on such of these ores as remain is discussed. Fully 500,000 tons of the allotted 5,000,000 will not come down. Some of the Gogebic mines never started up because the prices fixed meant operation at a loss. There is no expectation of an increased allotment, the experience of 1895, when 200,000 tons and upward was added late in the season, having proved unpleasant to the ore men as well as to the buyers, who found later that the extra ore was not needed. The largest firms in the Pittsburg district were among late buyers, a fact which, taken in connection with others, is an indication that the furnace practice of 1897 has tended rather to a smaller than a larger percentage of Mesabi ores than in 1896. The percentage now generally employed does not go much if any above 40 per cent.

Pig Iron. The advance in steel billets has made a stronger market in Bessemer iron. For September and October delivery $9.25 in the valley is possible, though some sellers have refused it. Business to the extent of 5,000 tons is reported closed at $9.50, valley furnace, deliveries through the first quarter of 1898. Inquiries are more frequent for forge iron, but buyers do not offer better than $8.10 at valley mill, though $8.25 is asked on deliveries through the year. Sales of foundry iron continue in a moderate way, prices ranging from $8.75 to $9.25 in the valley for No. 2 foundry. We quote Cleveland delivery:

Bessemer	$9 90@10 15	Valley Scotch No. 1	$10 15@10 40
No. 1 Strong Foundry	10 25@10 65	Valley Scotch No. 2	9 75@10 00
No. 2 Strong Foundry	9 50@10 00	Gray Forge	8 65@ 8 75
No. 3 Foundry	9 25@ 9 40	Lake Superior Charcoal	12 25@12 75

Billets and Rods. Another considerable inquiry for billets has been made by a Cleveland interest, some basic stock being included. It is reported that prices quoted from one direction are almost as low as those touched in recent transactions, which were at at $13.85 and $13.90, delivered. Other sellers, however, ask advances of 25 to 50 cents. In rods there is considerabe inquiry. Cleveland quotations are $19.50 to $20, with the latter figure asked on forward deliveries.

Finished Material. There is more firmness in sheets, pipe, bar iron and steel, and in structural material the 1.05c, Pittsburg, basis is generally adhered to. Bar iron is 1c, Cleveland, on ordinary business and steel is quoted 1.05c, though some sellers are asking 1c, Pittsburg. Recent contracts include 3,000 tons of material for Nickel Plate bridge work, taken by an Eastern mill at 2.05c erected; 1,400 tons of plates and shapes to a Warren, O., concern, having the contract for the new steel elevator at Ft. William; 600 tons by the Massillon Bridge Works, for the Valley Railway train shed, the business going to Pittsburg. At Toledo a new swing bridge will call for considerable material and a local works will buy steel for a California sugar house it is to erect. Local bridge works are very busy. Orders in all lines of rolled products are widely distributed and the aggregate is made up of many small orders.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1143 MONADNOCK BLOCK, Aug. 25.

Conditions have changed very little in the week. The amount of business closed was quite large in some lines, but in others has not increased appreciably. Confidence in the future is predominant, and both sellers and buyers are looking forward to a good fall business. The demand for iron products from the country trade continues exceptionally good, and manufacturers of this class of material are putting on more men all the time, and increasing their production. Everything points to a continuance of the improvement which is now so generally recognized. The local mills did a large business in all classes of steel last week, and have a good number of inquiries still unfilled. Pig iron dealers report an increase in the inquiry, and sales last week were fully up to those of the week before, possibly larger. The car builders in this territory are all running full time, with orders ahead for the balance of the year, and several roads are figuring on further orders for cars. Foundries here are not having exactly a rush of orders, but their business is gradually growing better, and there is not thought to be the slightest danger of a slump in the volume of business.

PIG IRON.—The local furnaces did a fair business last week, and have still a good number of inquireis. Orders placed were none of them large, but they were many, coming from all classes of foundries, and from all parts of the territory. The Southern furnaces report that the demand for their iron appears to be increasing considerably. No especially large sales were closed, the largest being 1,000 tons, but the business comes from a wide territory and gives symptoms of an awakening in the foundry business. A good many of the orders placed recently were from concerns whose previous orders were supposed to be large enough to carry them considerably beyond this time, but whose business has been much better than they anticipated. Prices are firm, neither Northern nor Southern furnaces making any reductions to secure business except in rare cases. Quotations are unchanged.

Lake Sup. Charcoal	$13 00@13 25	South'n Coke No. 3	9 60@ 9 85
Local Coke Fdy. No. 1	10 50@10 75	Southern No. 1 Soft	$10 50@10 60
Local Coke Fdy. No. 2	10 25@10 50	Southern No. 2 Soft	9 85@10 35
Local Coke Fdy. No. 3	10 00@10 25	South'n Silveries	10 35@10 60
Local Scotch Fdy. No. 1	10 50@10 75	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	10 25@10 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 25	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 75@11 00	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	9 85@10 10	Coke Bessemer	11 50@12 00

BARS.—Car orders placed and under consideration furnish the larger part of the bar iron and steel business being done, and several considerable contracts have been placed for material. Further orders for cars will be placed soon. The C. & O. Ry. has asked for prices on 1,000 cars, the C., C., C. & St. L. Ry. on 1,000 cars, and the C., N. O. & T. P. on 500 cars. It is likely that these orders will be placed in the present week. General business in bars is quite good, most of the orders being for lots under 500 tons and running down to car loads. Prices are firm, and are made at 1.05c to 1.10c for both common iron and soft steel bars from strictly billet stock. Guaranteed iron is quoted at 1.20c.

RAILS AND TRACK SUPPLIES.—The local mills are filled with orders for heavy section rails until the end of the year, and are not accepting business except such small lots as they are able to work in. The inquiry for light sections is quite good, but orders are limited to small lots in nearly all cases. Quotations are made: Rails, $19 to $21, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—A quite large business has been done in the past week. No figures as to tonnage are obtainable, but it probably exceeds that of any previous week for some time. The larger part of the business was in rods, the wire and nail people having made heavy purchases. The demand for both billets and rods is very good, and it is likely that the business for the next week or two will be heavy. Prices are firm, and it is said that billets have sold for $15.25 in the week, this market. They continue to be quoted at $15, and rods at $21.

STRUCTURAL MATERIAL.—No large contracts have been placed in the week but the general run of small orders has been excellent. The contract for the Pennsylvania Railroad elevation material has not yet been placed, but will be soon. Prices are firm and unchanged. We quote: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—Boiler manufacturers have bought quite heavily in the week, several contracts of large size having been placed. The demand from this class of trade has been excellent for several weeks and continues. Other buyers are doing nearly as well, and the total tonnage placed in this market has been very satisfactory to the mills. Quotations are firm: Tank steel, 1.10c to 1.20c; flange steel, 1.20c to 1.25c; fire box steel, 1.85c to 5c.

SHEETS.—Buyers have not taken much material in the week. The demand is fairly good, and seems likely to continue. Quotations are made at 1.90c to 2c for No. 27 black, and 80 and 10 per cent discount for galvanized.

MERCHANT STEEL.—Inquiries for large lots were more frequent, and trade has increased appreciably. Buyers are more willing to consider large purchases than for a long time past, and have been making quite heavy trades of late. Last week was no exception. The market continues firm, although no advances have been made. Quotations are as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—There is very little demand for material from the consumers, but there has been considerable trading back and forth among the dealers. No very large deals have been made, however. The market is firm, considering the condition of trade, and prices are very little changed from last week. The quotations below represent dealer's asking prices for old material:

Old iron rails, gross	$11 25@$11 50	Axles, net	$13 50@$14 00
Old steel rails, gross	7 @ 7 50	Cast borings, net	2 75
Old wheels, gross	10 00@ 10 25	Wrought turnings, net	4 00@ 4 50
Railroad forge, net	10 50@ 11 00	Axle turnings, net	5 50@ 6 00
Dealer's forge, net	9 00@ 9 50	Mixed steel, gross	6 25
No. 1 mill, net	7 50@ 8 00	Stove plates, net	5 50@ 6 00
Heavy cast, net	7 50@ 7 75	Heavy melting steel, gr.	7 00@ 7 50
Malleable cast, net	8 00@ 8 50	Old iron splice b., gr.	11 00@ 11 25

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Aug. 25.

Owing to their scarcity, steel billets and rods show a sharp advance. How far temporarily restricted capacity has effected the 50 to 75 cents advance on billets remains to be seen. For the present the advance is rigidly held. Skelp, sheets and tin plate have had an active week and in each case prices are stronger. Pipe manufacturers have agreed on another five per cent advance in prices and in one case this action was followed by a restoration of the ten per cent cut in wages made necessary last March. All structural shapes excepting beams are bringing new prices. Pig iron is as yet little affected.

PIG IRON.—In sympathy with steel the feeling in pig iron is more encouraging. Other than a sale of 5,000 tons of Pittsburg iron at $9.75, September and October, there is little to gauge the advance claimed. In valley quotations $9.25 is said to be minimum for early deliveries and a Pittsburg selling interest is offering $9.40, valley, deliveries in the first quarter of 1898. Pittsburg furnaces are not eager to sell and ask $9.65 to $9.90. Foundry irons has shown no return to recent prices. Quotations are made as follows:

Bessemer at valley furnace	$9.25	to	$9.50
Bessemer delivered Pittsburg District	9.65	to	9.90
No. 1 Foundry	10.25	to	10.50
No. 2 Foundry	9.25	to	9.65
No. 3 Foundry	9.00	to	9.25
Gray Forge	8.25	to	8.75

BILLETS AND RODS.—The difficulty in getting prompt shipments of steel has infused strength into billets and rods and raised prices perceptibly. Two Pittsburg mills are virtually out of the market and are asking $15. September deliveries, however, can be had at from $14.50 to $14.75, with the latter generally ruling. For later deliveries the Wheeling and valley districts have sold heavily and Cleveland inquiries are now large. There has been much small business closed in Pittsburg, mostly for September and October deliveries. Rods are scarce and quotations are fluctuating, so much so that the actual market is not easily found. All quotations on rods are higher within the last 24 hours. Quotations of the week have varied from $19.50 to $21.50.

STRUCTURAL MATERIAL.—Higher prices on structural material are generally held, with the exception of beams. On these 1c is minimum and 1.05c to 1.10c prevails on small business. For other shapes the demand is strong and mills are booked well ahead. On plates and angles 1c is asked, and with some sellers is minimum on ordinary business. Tees and zees are quoted at 1.15c to 1.25c.

PLATES.—Mill quotations follow: Tank, Bessemer, 1c to 1.05c; open-hearth, 1.05c to 1.10c; shell, 1.20c to 1.25c; flange 1.25c to 1.30c.

RAILROAD AND TRACK SUPPLIES.—Quotations on track material are made locally as follows: Splice bars, 1.10c to 1.15c; track bolts, iron, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; links and pins, 1.15c to 1.20c.

MERCHANT STEEL.—Business for the week in merchant steel was heavier in volume than for many months. Prices are on the mend. We quote: Open-hearth spring, 1.35c to 1.40c; open-hearth machinery, 1.15c to 1.20c; machine-straightened tire, 1.25c to 1.30c; soft steel bars, 1.25c; toe calk, 1.35c to 1.40c; sleigh shoe, 1.25c; tool steel, ordinary grades, 5c to 7c; branded, 10c and upwards.

IRON AND STEEL SKELP.—Conditions in pipe are reflected in higher skelp and largely increased demand. The idle mills are of course assisting in the improvement. The week has brought heavy sales of both steel and iron skelp. Quotations are made as follows: Grooved steel skelp, 92½c to 95c; sheared steel skelp, 1.02½c to 1.05c; grooved iron skelp, 1.05c to 1.07½c; sheared iron skelp, 1.20c to 1.25c; four months, or two per cent off for cash, 30 days.

BARS.—Valley mills are not so comfortably filled as Pittsburg interests, and are taking much of the business in sight at recent prices. On steel bars local quotations are based on 1c as minimum. Bar iron is in better shape but 1c can still be shaded. We quote muck bar at $17.50 to $17.75 for good neutral.

SHEETS.—The scarcity in sheets is beginning to tell on quoted prices and sales of No. 28 were made at 2c and over. We note a sale of 1,000 tons at these terms for prompt shipment. Sheets for present needs are in great demand and are with difficulty secured at all. No. 26 is firm at 1.90c, and No. 27, 1.95c, though both have been quoted higher. Galvanized sheets are held at 80 and 5 per cent off list. Future deliveries on all sheets are readily taken at higher quotations.

TIN PLATE.—Prompt plates are still difficult to find and both for present and future deliveries prices are stiffer than a week ago. Local quotations on 100-lb. cokes are $3 to $3.10.

PIPES AND TUBES.—Pipe manufacturers have agreed on a five per cent advance on all kinds of pipe and it is already in force. The advance is general and will probably be established by transactions this week. The National Tube Works followed up this action with a general increase of ten per cent in wages and some other mills will probably do likewise in the next few days. On less than carload lots, six tens is quoted and six tens and two and a half per cent on larger lots. A ten-mile order of ten-inch line pipe was taken by a local mill last week. The contract is with a Pittsburg company. On merchant boiler tubes we quote: Two and a quarter inch and smaller, 75 per cent discount; two and a half inches and over, 75 and 10 per cent discount. The following quotations on casing are firmly maintained: Screw and socket joint, 62½ per cent discount; inserted joint, 57½ per cent discount.

FERRO-MANGANESE.—Domestic is firmer and is quoted at $46.

OLD MATERIAL.—Sales are on the increase. Steel rails brought $9.50, gross, in the week; wrought scrap, No. 1, $9.50, net; cast scrap, $8.35, gross; cast borings, $5.50, gross; car wheels, $8.25, gross.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Philadelphia While it is generally recognized that little would be required to bring a stiffening in prices for iron and steel, the market has thus far given little response to the feeling of improvement everywhere felt. Increased activity is reported in some lines, particularly in plates, shapes and sheets, but mill capacity is ample and little difficulty is met with as yet, in making shipments. The pig iron situation is unchanged. Sellers are confident that better money will be had under fall buying, but the only point that seems to be conceded by buyers thus far is that prices are not likely to fall away from the level recently maintained. The demand for iron has been fair, but sellers are plentiful and there is no trouble in getting deliveries. Foundries here and there are getting a little more work, but the improvement in other cases is not recognizable. Certainly prices of castings are as low as at any time in the year. There is more iron going into cupolas than had been counted on, however, and a number of buyers who had considered themselves covered for the balance of the year expect to be in the market this fall. We hear of sales of No. 2x at $10.50, though most sellers have asked 25 to 50 cents above this. The range of quotations follows: No. 1x foundry, $12 to $12.50; No. 2x foundry, $10.50 to $11.25; No. 2 plain, $10.25; standard mill irons, $10; ordinary mill irons, $9.75. The billet market is strong and sales have been made at $16.75 and mills are quite full. The advance in Bessemer iron in Western markets is felt in steel, and some mills are asking $17. Finished material continues in good demand, the orders being mostly for moderate tonnage. Car scarcity is talked of but new orders for locomotives and cars are not plentiful. The mills are running on better schedules and prospects are good for later orders. Bars are perhaps weaker than other products. We quote plates at 1.15c to 1.20c; angles, 1.15c to 1.20c; beams, 1.25c to 1.40c; bar iron, 1.07½c to 1.10c; special branded iron, 1.20c to 1.30c; steel bars, 1.10c to 1.15c.

Buffalo. So far August has shown up remarkably well. There has been a slight increase in the volume of business done over last week, both in the way of new orders and requests for shipment on existing contracts. Prices remain unchanged. We quote below on the cash basis f. o. b. cars Buffalo: No. 1 strong foundry coke iron, Lake Superior ore, $10.50; No. 2, $10; Ohio strong softener, No. 1, $10.50; No. 2, $10; Jackson county silvery, No. 1, $14; Southern soft, No. 1, $10.75; No. 2, $10.50; Niagara malleable, $10.25.

Cincinnati. The present week started well in pig iron, a good number of inquiries ranging from 200 to 1,000 tons being received, and in a few cases running up to 1,500 tons. Sales thus far made, like those of the preceding week, range from 50 to 200 tons, and include a few of 500 tons. Jackson county silveries have sold in small quantities. Very little is doing as yet in Lake Superior or Southern car wheel irons. The demand for cars has not proved very strong thus far. Prices are generally held firmly on Southern irons, though gray forge has sold at $6.15 at furnace, and even $6 has been heard of recently, though it is doubtful if this could be done to-day. There is more tendency to low prices in Northern than in Southern irons. On a No. 3 Hanging Rock coke iron the quoted price has been shaded from 30 to 50 cents. We quote as follows: Southern coke, No. 1 foundry, $9.75 to $10; No. 2, $9 to $9.25; No. 3, $8.75; gray forge, $8.50; mottled, $8.25 to $8.50; No. 1 soft, $9.50 to $9.75; No. 2, $9.25 to $9.50; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson county silvery, No. 1, $12.50 to $13; standard Georgia car wheel, $14.25 to $15; Tennesse car wheel, $13 to $14. Finished material is held with a little more firmness and on ordinary small-lot business structural shapes have been quoted $2 a ton higher. Iron and steel bars are about $1 a ton higher, with a steady and fair demand. In angles and tank and boiler steel, orders reach a good aggregate. We quote: Beams and channels, 1.40c; angles, 1.15c to 1.20c; bar iron, 1.15c to 1.25c; steel bars, 1.15c to 1.20c; tank steel, 1.20c; flange steel, 1.40c.

THE striking employes of the puddling department of the National Tube Works, at McKeesport, Pa., have agreed to accept the $4 rate without a signed agreement covering the next year, but until the coal supply becomes easier no attempt will be made to resume operations.

THE employes of the Britton Rolling Mill Co.'s tin plate plant, Cleveland, resumed their places Monday, after a week's strike. The men insisted that the company should sign the scale and unionize the mill. By the final settlement, the company signed an agreement to pay scale wages, but the mill will be run "open," as heretofore.

THE statement now current regarding the removal of the Shiffler Bridge Works from Pittsburg proves premature.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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AUGUST 26, 1897.

BRITISH FEAR OF AMERICAN INROADS.

The great strike that is still on in the engineering trades of Great Britain, for an eight-hour day, illustrates a condition that is giving British manufacturers more and more concern. It is not a new complaint, that the restriction of labor unions have been a constant brake upon the wheels of industrial progress in the United Kindgom. But the advance in practice in competitive countries and the resulting inroads upon British trade are intensifying the feeling and giving greater prominence to the question in all economic discussions.

Mr. J. S. Jeans, secretary of the British Iron Trade Association, in a recent article in the *Iron and Coal Trades Review*, jars somewhat rudely upon the complacency of those who have been wont to think of England as the abiding synonym of commercial and industrial supremacy. He says that the working population of England has not appreciated the enormous increase in the ability of the United States to compete not only for neutral but also for British markets. The competition from this country he regards as "more to be dreaded than the competition of Germany and other Continental countries, serious and increasingly successful at that rivalry has been." He refers to the foothold obtained by American pig iron, rails, billets, cars, locomotives, cranes, machine tools, etc., in England and in markets heretofore largely controlled by England, and suggests that the facts in this regard "should surely make our workmen pause in their ill-considered demands for conditions that would greatly assist that rival in a competition that already exposes our industries to unusual stress and strain." The conditions that have given the United States supremacy in cheap production he summarizes as follows:

1. The command of abundant supplies of raw materials of high quality at a cheap rate, in which respect they are much ahead of our own country.

2. The command of remarkably low rates of railway and canal transport, in which, again, they are much ahead of Great Britain.

3. The possession of highly efficient industrial and mechanical equipment—in which we include the newest and most modern processes and appliances—for which they are largely indebted to the ingenuity and adaptability of their working population.

4. The almost entire absence of the restrictions on industrial working which in our own country are imposed by trade unions, and the comparative rarity of serious labor disputes; and,

5. The high efficiency of American skilled artisans, and their abnormally high powers of production—an American workman turning out in many cases from one half more to twice as much as a British workman for a day's record.

Mr. Jeans is careful to say that he does not consider American workingmen as a rule more capable than British, but the former are more efficient, he says, because of American inventiveness and because workmen here are freer from unreasonable trade union restrictions on output and each is able to secure the full benefit of his skill and superiority.

"Against such a system of free labor," continues the article, "it is hardly conceivable that our union-ridden despotism will ever successfully compete;" and the agitation for an eight-hour day in England, it adds, will give American competitors a practical walk-over.

We believe undue stress has been laid in the above upon the differing status of trade unionism in the two countries. Manufacturers in the United States doubtless suffer less from the ill-considered and narrow restrictions of unions, but this condition has contributed far less to the marvelous reductions in the unit of cost of manufactured products than have the genius of American engineers, and American readiness to forsake the old for the better new thing, in equipment or practice. However, we quote these statements of a well-known English authority to indicate that the patronizing self-sufficiency that has stood out in the average British estimate of American achievement is being rapidly cured by recent industrial developments. We note, in the same connection, this significant sentence from another recent article by Mr. Jeans: "It is a fair presumption, then, that when the necessity comes to face foreign competition—which is rapidly being reached, even in the United States—conditions will be adapted thereto, so that English cost of production may be found too high for successful rivalry."

Interesting, too, is the correspondence between the British Iron Trade Association and the Board of Trade concerning the British government commission about to be sent to South and Central America, to get information with a view to the further development of British trade with those states. The British Iron Trade Association, in urging that it be given representation on the commission says that in the countries named "Continental and American competition in iron and steel, has of late years become very keen and is likely to become increasingly severe. The United States appear to have decided that they will in the future do with the South American countries what they have already attempted in the Canadian markets, and with considerable success—that is, to dispossess British manufacturers entirely, or almost so."

This is not a case, let us add, in which "forewarned is forearmed." It is a contest in which prestige, with increasing handicaps, is arrayed against natural advantages, reinforced by a brilliant

record of invention and the highest labor efficiency yet attained in the world. There can be no doubt of the ultimate outcome.

BEET SUGAR POSSIBILITIES.

The extent to which sugar beet culture and the erection of beet sugar plants have figured in the industrial news of the past few weeks, gives gratifying promise of such development of these industries as the Dingley bill was designed to secure. Contracts for new plants at Crockett, Cal., involving hundreds of thousands of dollars, have been let in the past week, and another enterprise of like proportions is under way at Rodeo, also in Contra Costa county. Sugar beet culture and the manufacture of beet sugar have been successfully prosecuted in California for some years. In New Mexico a good start has been made. At Eddy, in the Pecos valley, a factory was built last year and at Roswell, 75 miles north of Eddy, a factory with a capacity of 100,000 tons of beet sugar a year is to be erected. The irrigation of Pecos valley lands, in order to the development of beet growing, has already involved the expenditure of large sums of money, and the iron industry has been benefited, not only in the railroad building that has been necessary, but in the considerable expenditures for machinery for irrigation and the later investments in plants for the manufacture of raw sugar. Nebraska and Utah likewise have successfully established the double industry. Profitable employment has thus been found for a large acreage of land, and the manufacturing plants have kept many men at work. That the area in which sugar beets can be grown is not limited to the far West and Southwest is quite well established by testimony. A practical demonstration is furnished, moreover, in the convention at Rome, N. Y., a few days ago, in which farmers from six counties participated, all of them having contracted to furnish sugar beets to the new factory located at Rome.

It is estimated that of the $100,000,000 paid out by the United States for sugar imports last year, fully $25,000,000 was for beet sugar, from Germany, Austria, Russia and Italy. There is no obstacle now to the development of this industry at home on an extensive scale. Not only will it help to solve the problem that will again confront the American farmer after the present season of exceptional prosperity has passed, but it will mean a new outlet for our large machinery and engineering plants. While there is a general disposition to-day to look askance at the sugar schedule of the Dingley bill, we predict that the day is not far distant when both the agricultural and manufacturing communities will find occasion to refer to it as no less a benefaction than the now thoroughly vindicated McKinley bill.

THE growth of pig iron stocks in storage warrant yards has been exceptionally rapid in the past year. On Aug. 20, this year, the total was 248,400 tons, as against 157,200 tons on Aug. 31, 1896. For the year ending with this month the increase will be close to 100,000 tons.

THE Naval Commission created by an act of the recent Congress for the purpose of looking into the advisability of erecting or buying a Government plant for the manufacture of armor plate is this week at the Homestead Steel Works of the Carnegie Steel Co., Ltd. The commission consists of Commodore J. A Howell, chairman; Captain A. N. McCormick, Chief Engineer J. S. Perry, Civil Engineer M. T. Endicott; Lieutenants F. F. Fletcher and W. J. Chambers, and Clerk C. W. DeKnight. The commission while at Homestead is in charge of Ensign Althouse, Government inspector of armor plate at Homestead. The Bethlehem plant was visited last week.

Personal.

The Cardiff, Wales, meeting of the Iron and Steel Institute held in the first week in August was attended by Mr. E. F. Wood, of Philadelphia, and Mr. J. Wheelock, of Worcester, Mass. Mr. Guy R. Johnson, of Embreville, Tenn., and Mr. Horace W. Wyman, of Worcester, Mass., were elected to membership at this session.

R. N. Dickman, of Dickman & Mackenzie, Chicago analytical chemists, has been on a business trip covering several weeks, through New and Old Mexico and California, and is expected to return to Chicago the latter part of this week.

W. A. Pardee has resigned as secretary of the Akron (O.) Iron & Steel Co., to accept a position with the Whitman & Barnes Mfg. Co., of Akron.

Dr. Wm. B. Phillips and David Hancock, of Birmingham, Ala., have established the Phillips Testing Laboratory. Chemical work relating to iron and steel, coal and coke, is a specialty. Technical processes are investigated and reports are made on mining properties.

John Birkinbine, the well known engineer and iron ore expert, has gone on a trip to the Lake Superior country.

Sold to a French Syndicate.

A deal pending for several months and some time ago prematurely announced as closed, is finally a fact, and the Cleveland Machine Screw Co., of Cleveland, has disposed of its plant, patents, etc., to a syndicate of French capitalists. The company manufactures screw machines, steel balls, and machinery for the manufacture of the latter. Orders taken for this machinery in Europe in the latter part of 1896 are said to have aggregated $200,000. The capital of the company has been $500,000. The purchase price is not given but is upwards of $1,000,000. The new company will incorporate in November with $3,000,000 capital, and is expected to enlarge the plant considerably. The management will not change, it is said, J. D. Climo continuing as secretary and J. B. Clyne as superintendent. The personnel of the purchasing syndicate is not given.

THE letting of contracts for an extensive beet sugar plant and refinery to be located at Crockett, Contra Costa county, Cal., gives a large contract to the Kilby Mfg. Co., of Cleveland. The company engaged in the undertaking is backed by strong capital, Geo. W. McNear, the Pacific Coast wheat king, being connected with it, according to report. The Kilby Mfg. Co.'s contract includes the erection of the buildings and the urnishing of the machinery, and amounts to $500,000 to $600,000. The steel for the buildings and the castings for the equipment will make a total of 1,500 to 2,000 tons of material.

THE following shows the trade from the United States to Japan of the articles mentioned for 1897: Wheat flour, $819,620; cotton, $2,345,016; cotton cloths, $141,264; machnery, $909,031; manufactures iron and steel, $2,768,752; leather, $213,853; oils, mineral, refined, $4,222,383; paraffine, $171,476; tobacco, $407,577; wood and manufactures of, $218,714. Notwithstanding the heavy increase in exports the United States buys more from Japan than we sell to that country. During the year just ended the value of Japanese goods brought into the United States was $24,009,756. Compared with last year this is a decrease of about $1,500,000.

THERE is a steady increase in stocks in warrant yards, in accordance with the terms of speculative sales of Southern irons made some time ago, and further deliveries of the sort may be expected in the next few weeks. The total in yard Aug. 20 was 248,400 tons, 11,600 tons having been put in yard in the preceding ten days and 2,100 tons withdrawn.

IMPROVED PIT FURNACE.

A patent soaking pit arrangement has been devised by Miller Bros. & Co., of the Tradesmen's Bldg., Pittsburg, contractors for the erection of fire brick furnaces. An examination of the illustrations will suggest some of the advantages secured in this construction, first of which is that each pit is independent of the others and under separate control. Thus it is possible to get as much heat in the sixth hole as in the first, whereas in the type of furnace in which the holes are connected with general regenerating chambers, the hole nearest the gas inlet is the hottest and with each succeeding one the temperature is lower, until in the last hole the heat is apt to be below the limit of efficiency. The arrangement shown permits of attaining any desired heat in any pit. The sixth hole, instead of being necessarily the coolest, may be made the hottest, or an equal degree of heat may be maintained in all at the same time.

The handling of the waste heat is another feature that has had special study. The provision of large air chambers and their arrangement relative to the holes, gives them the full benefit of the return heat. This will be recognized as a desirable economy over the more familiar arrangement by which the waste heat, seeking the first outlet, naturally goes to the gas chamber, only that which the latter cannot accommodate going to the air chamber.

The valves are water filled and so constructed as to have a continuous flow of water through them, insuring an indefinite period of service. They are easily made and the cost is nominal. This flue and valve arrangement is now in successful operation at the Midland Steel Co.'s open-hearth plant at Muncie, Ind.

The 12-hole furnace shown will accommodate 48 ingots 18 inches square and a furnace of the same type may be built to hold 60 ingots of this size, in either case with a large saving, it is claimed, over other forms of furnaces having the same capacity. The independent operation of individual pits, after the Miller Bros.' plan, saves the shutting down of the entire furnace for the placing or removal of ingots, and guarantees continuity of operation.

All foundation work is of concrete, overlaid with second quality of fire brick. First quality fire brick are used in all flue and chamber walls, and red brick in the outer construction.

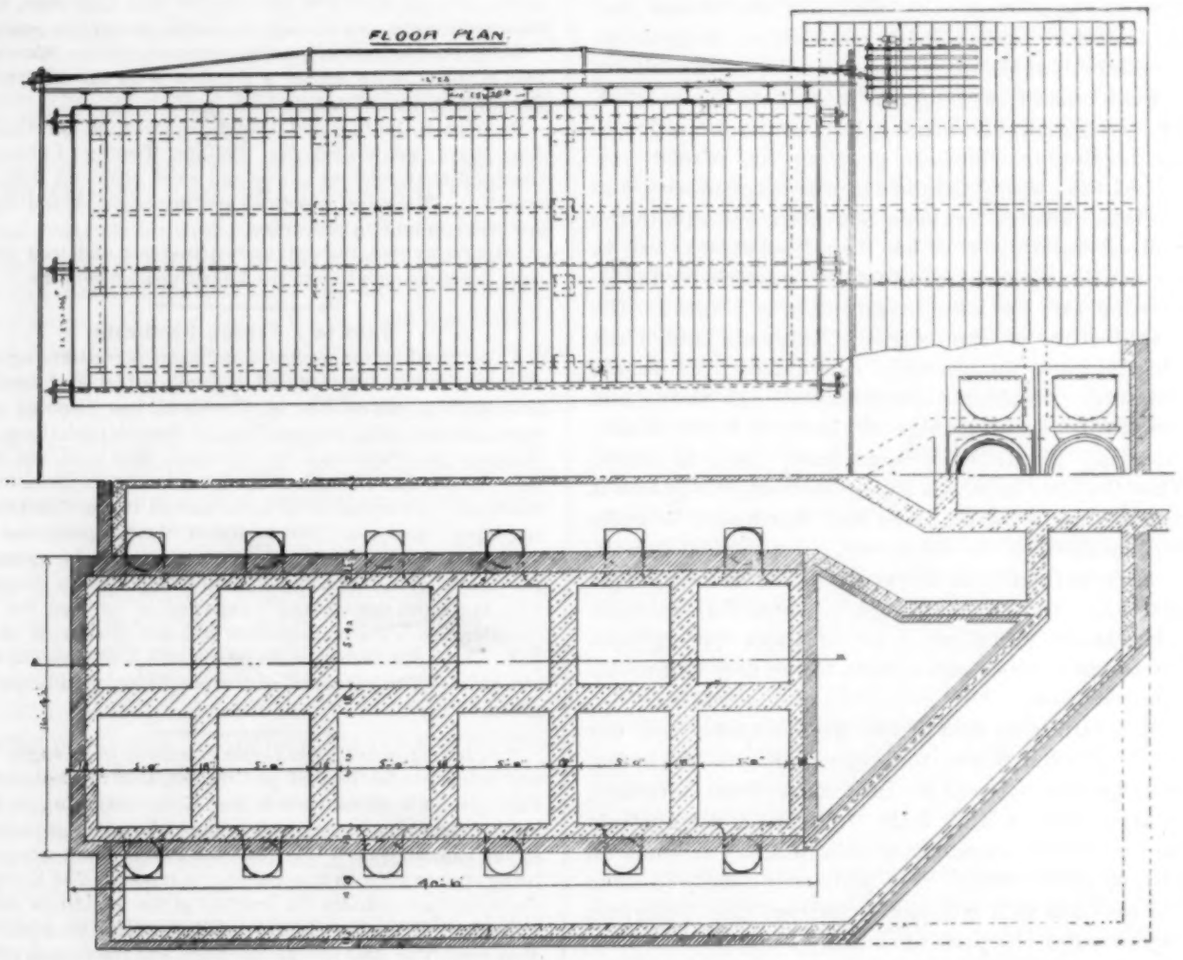


FIG. 1.—MILLER PATENT SOAKING PIT ARRANGEMENT. PLAN.

CONDENSED FROM THE TECHNICAL PRESS.

Microscopy and Practice.—[*Stahl und Eisen*, April 15.]—In a very interesting article by Prof. Ledebur the question of the application of microscopic methods to the study of steel as met with in current practice, is ably discussed. After giving the history of the successes prominent investigators have met with, he takes up the probability of the microscope being employed as a regular adjunct to every steel and iron works. The circumstances which have led to a considerable difference of opinion on the part of the investigators will very likely postpone the general introduction of microscopic methods for some time. Still those works which have gone to the expense of establishing this laboratory department, and have as a consequence been enabled to obtain a complete history of their processes, both good and bad, will not regret the outlay, as they can now find out the reason of the mysterious failures when chemical analysis shows everything to be right. Moreover, results can be predicted with given modes of treatment, and as a consequence there can be indicated the best methods of obtaining a desired product. In going into the discussion of the various substances met with in the study of steel, Prof. Ledebur gives the following: Ferrite, or nearly pure iron, only found in steels with less than .8 carbon. Next comes a carbide of iron, called cementite, very hard and found in the pure state only in annealed high carbon steels. In low carbon steels this cementite and the pure iron become mixed up and form what is called pearlite. Even this pearlite is supposed to occur in two distinct forms, the lamellar kind found in well annealed steel, and the granular, which is present in annealed steel which has been hammered

while still hot. That form of carbon which exists in solution in the iron while at a very high heat, and is fixed in that form by sudden quenching, is called martensite. A further form of carbon is mentioned as discovered by Prof. Arnold, but is left as an open question, other investigators not having come across it as yet. The paper then discusses the relation of microscopic research to the existing chemical theories of the nature of iron, and hopes for future developments which will lead to a better understanding of the subject, and a mutual agreement as a consequence. The application of microscopic study to practice is taken up and the subject of steel rails in service discussed. It has long been noticed that steel rails fresh from the mills can stand a considerable shock before breaking, while upon being taken up after some length of time in service, and subjected to the same test they fail miserably. A special feature is the brittleness of the rail when laid head down, which causes tension in the head when struck by the drop hammer. This brittleness is, however, found only in the head, for on removing about an eighth of an inch by planing, old rails prove to be as strong as new ones. A microscopic examination of the heads of old rails developed the fact that the surface was covered with microscopic cracks which extended inwards no further than one hundredth of an inch, on the average. Experiments were made which brought out the fact that old rails as well as those used only a short time had a surface layer of harder steel than the rest of the body. This layer, distinctly recognizable under the microscope, averaged about one-hundredth of an inch in thickness, and when it was removed by filing, the rail was brought to normal strength again. A number of rails which had no surface cracks were heated to redness and cooled slowly, and when tested were found of normal strength. A number of very thin cross sections were taken for the purpose of making delicate physical tests. On cutting off the bad portion and attempting to bend these hard filaments, those which had surface cracks broke off short. Again, those without cracks behaved like hard drawn wires; they could be bent to a considerable angle but returned to their original state when released. When, however, their elastic limit was overstepped, they would break off at once if the surface of the rail was on the convex side, but not if on the concave. The inner portions of the rail could all be bent to 180 degrees without breaking. As a consequence it would seem that the continued use of a rail developes a thin layer of a very hard nature at the wearing surface, which can be removed by reheating. Should the surface show cracks, however, the rail cannot be restored to its original strength any more. The microscope is therefore able to settle this fact at once. Furthermore, in examining a freshly broken rail, any existing cracks invariably show the effects of rusting, which is good evidence of their presence and also the depth to which they extend. Another very interesting development was the fact that this surface layer exhibited unmistakable signs of movement or leaning on the part of the crystals, which was always in one direction. This was evidently caused by the rolling stock, the action of the drivers of the locomotive being to push the crystals backward, while the train itself acts the other way, and of course preponderates. This flowing of steel can be readily seen on all rails which show the pushing off of the metal sideways.

The above observations were made by Stead, in England, who gives an elaborate discussion of the probable causes, and it may indeed be considered a triumph of microscopic investigation. The paper goes on with the discussion of a broken propeller shaft which was subjected to chemical and microscopical examination. The point of note, structurally, was the rather poor inner portion with an excellent rim. This interior was porous, due probably to the shrinkage while casting. In making the chemical investigation, one sample was taken from the rim and another from the center. The silicon and manganese were found nearly the same; the carbon of the interior was 50 per cent higher and the phosphorus and sulphur in like manner three times as high. This would show that the ingot was poured too hot, allowing the segregation of impurities in the center. A microscopical investigation showed at once that the steel was certainly unsuited for the purpose, the hard and soft portions of the iron being sharply separated instead of gradually blending together. Moreover the sulphide of iron was distinctly visible. On the whole the shaft evidently had not received enough work under the hammer. The paper concludes with a discussion of the supposed tendency of cracks to form in the center and extend outward, forming the basis of the English admiralty's practice of boring out the shaft as a precaution. M.

Investigation of a Peculiar Blast Furnace Product.—[*Stahl und Eisen, June 1.*]—L. Frank contributes a communication regarding his studies of peculiar blast furnace products. The material in question had the color of iron, was partly crystallized, and when freshly fractured showed up a number of small shining copper colored dots. These were found to be compounds of titanium. The material could be easily powdered but contained substances which resisted the hardest of steel. Now follows a description of various tests made, and the peculiar phenomena observed, this being of more special value to chemists. But the general results will be interesting to blast furnace men, for there were found ferrocynides, sulphides, phosphides, arsenides, carbides and silicates. Seven varieties of graphite distinguishable by their specific gravities; cyanogen compounds of titanium and nitrogen, etc., and finally corborundum, and the diamond. The author rightly remarks that there is much to be learned in investigating these peculiar blast furnace products, and that many little points might be gained falling within the scope of chemical geology, and more especially the artificial production of the diamond. M.

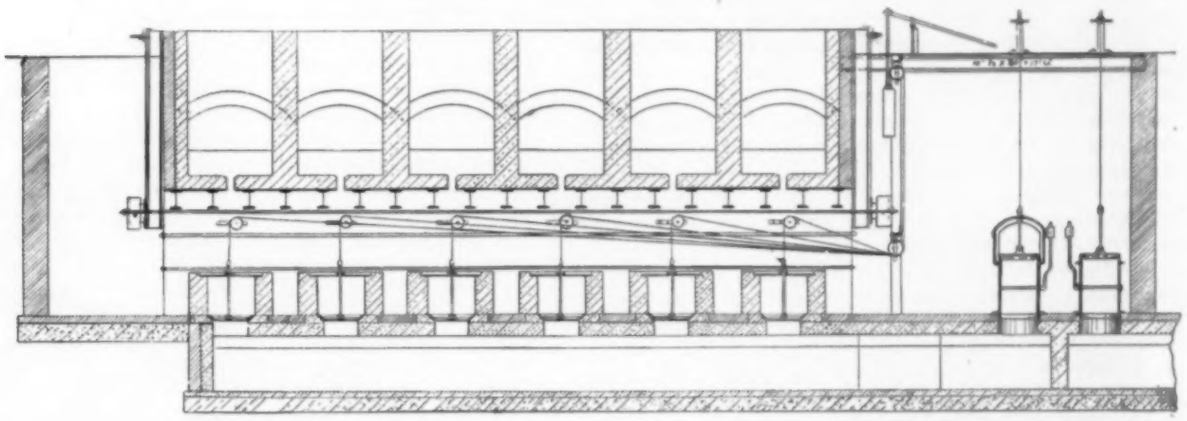


FIG. 2.—MILLER PATENT SOAKING PIT ARRANGEMENT. CENTRAL LONGITUDINAL SECTION.

Thermometers for Very Low Temperatures.—[*Wiedeman, Annalen 1897, p. 463.*]—If it is desired to make use of thermometers for measuring temperatures which go below the range of the usual instruments containing alcohol, petroleum ether will answer the purpose. This hydrocarbon has peculiar properties of contraction, which at 300 F. below zero amounts to one-fifth of its volume when at the freezing point, and one-quarter of its volume when at 800 F. It is therefore perfectly feasible to record temperatures which run down as low as that of boiling air, or 3100 F. below zero. M.

THE Tin Plate Manufacturers' Association meets in Pittsburg, Thursday, of this week.

LAKE SUPERIOR IRON MINES.

The strike at Marquette range mines, promised in newspaper dispatches, did not materialize, for the reasons given in these columns last week. The miners at Ishpeming and Negaunee had all they cared for of idleness two years ago, and were not to be led into a repetition of that experience merely to keep organizers and agitators employed at a good salary. Under date of Aug. 18 the Mine Workers' Union of Ishpeming, through its president, sent a notice to the mining companies saying that they would refuse to work alongside men whom they regarded as a "menace" to their "collective rights." At the same time, the notice continued, they would "not attempt to dictate to nor in any way interfere as to whom said companies shall employ, provided said employes will abide by the decision of the majority which now is: That all mine workers must either join our organization or steps will be taken that will not be agreeable to either employer or employe." In other words, there would be no dictation or trouble from the union provided it had its way! The mining companies at Ishpeming promptly posted a notice, signed by the Lake Superior Iron Co., the Pittsburg & Lake Angeline Co., and the Cleveland Iron Mining Co., saying that they did not recognize a union among their employes and that they would not discriminate between members and non-members. "If, however, " the notice continued, "we are finally compelled to disciminate between union and non-union men by reason of the threats and the efforts of the union, we shall unhesitatingly recognize the union as having caused the trouble, as arraying itself against our free action, as having, by the ill advised threats of its officers declared itself unfriendly to us, and shall then discriminate in favor of men who do not antagonize us—the non-union men." A meeting of the union men was held on Sunday, addressed by their president and secretary. The outcome is indicated by the fact that on Monday, Aug. 23, the day named in the notice to the companies, for drawing the line against non-union miners, every mine was running as usual. There is no strike and no evidence of ill-feeling, and no prospect that any attempt will be made to carry out the threat of the leaders.

The Ballou Mining Co. has been organized at Florence, Wis., to operate the Hiawatha mine at Iron River, Mich. M. H. Ballou is president and Wm. H. Selden, of Stambaugh, Mich., owner of the fee of the property, is treasurer. The royalty is very low. The company has 10,000 tons of ore in sight and will ship ore this year if a C. & N. W. spur can be secured.

The caved shaft of the Columbia mine has been reopened and water is being taken from the lower levels.

Indications are that Duluth's shipments will be about 2,300,000 tons his season, and those from Two Harbors about 2,400,000 tons, with enough from Superior to make a total of five and a quarter millions for the Mesabi and Vermilion ranges.

The Florence Iron River Mining Co. has sold 25,000 tons from its stockpiles in which is a total of about 150,000 tons.

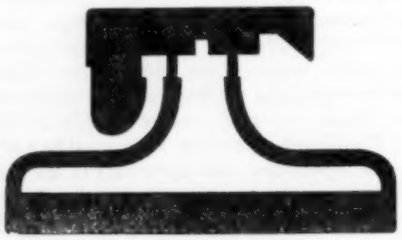
At the Mahoning mine business is moving along in good form both in stripping and mining. Over 350,000 tons of ore has already been shipped and about 600 tons is going forward daily. It is expected that this mine will ship about 500,000 tons and possibly more during the season, as connected companies consume the product. Something like 1,000,000 yards of earth is to be removed before the mine will be fully opened. This means two years' work. A new Bucyrus shovel will be added to the outfit for next season's work, which will make three in use here, of the most approved pattern.—[Hibbing News.

The Lake Superior Consolidated Iron Mines will begin at once to put the Pillsbury property, two and a half miles west of Hibbing, in shape to mine ore by the spring of 1898. The D., M. & N. Road will be extended from Hibbing. Hoisting and other equipment for the property are being figured on.

STRUTHERS Furnace, of Runyon, Stubbs & Co., at Struthers, O., is being made ready for blast and will go in about Sept. 1. A contract has just been signed for the installation of the Uehling system of casting and conveying pig iron. This, with the improvements which have been made of late in this furnace, will give it considerably larger output and better economies than ever.

THE HOLLAND CORE COMPOUND.

A new core compound has recently been put upon the market by the Holland Linseed Oil Co., 685 Austin ave., Chicago, which, it is claimed, has features peculiar to itself and of great value, in the making of intricate and fancy cores. It is claimed that the Holland product will more than pay for itself in the number of castings saved that would otherwise be lost, and that the cost of preparing the cores is much less because of the time saved. It is stated that an intricate and slender core can be made in much less time with this compound and sand than from flour. For such cases 30 parts of sand to one part of the compound are used (measurement, not weight). For cores that are not frail, but rather stout and square, much more sand can be used. Some of the Chicago foundrymen using this compound take from 30 to 60 parts of sand to one of compound, according to the kind of core to be made. It is said that the castings are rendered smoother and the corners sharper as the iron does not burn into the core as it



does into one made of flour. When the core made with the compound is properly baked it will create no gas, and will leave the iron with much greater rapidity. The great heat of the iron puts the sand in condition to run out of the hollow and leave the iron smooth and clean. For long, slender and round cores a little molding sand is mixed with the core sand in order to keep it together before baking. After baking a core made of this compound is said to be stronger and harder than a flour core, although it is not quite as strong before baking. Any quantity of material for the making of cores can be prepared at one time, and will remain in good condition indefinitely, as the elements do not affect it. One important feature is the guarantee that cores can be made from it successfully without a vent. For testing purposes a sample is furnished by the manufacturers on application.

The cut herewith is an illustration of the intricate cores that have been made with this compound. The core shown is one that was made by a Chicago foundryman, and used with perfectly satisfactory results, no vent being necessary.

THE labor difficulties at the American Iron & Steel Works of Jones & Laughlins, which were settled before the adjustment of the finishing scale at Youngstown, broke out afresh last Thursday, when roughers, heaters and helpers struck for the schedule agreed upon at Youngstown. The agreement at the American works called for a general reduction of 15 per cent and this was accepted by the wage committee of the workers. Dissatisfaction followed the announcement of the Youngstown scale, however. The company refused to concede the request on the ground that the schedule accepted by the men contained no reference to any possible change in other mills and was accepted thus unconditionally by the workers. The company on Monday submitted their ultimatum offering all old employes their places and notifying them that unless accepted at once others would be given the vacated places. A large proportion of the strikers returned and the works will probably be in full operation before the week closes.

THE Washington *Post* makes this reference to the visit paid in June by Hon. Thos. F. Bayard to Cleveland and Lorain as the guest of Tom L. Johnson: "It turns out that his mission was in behalf of British capitalists, who have been asked to supply funds for an enlargement of the Johnson Co.'s iron and steel plant, at Lorain. Mr. Bayard visited the works while here, and has since reported favorably to his English clients on the extension project. The contemplated improvements include blast furnaces and a plant for the manufacture of coke, to cost hundreds of thousands of dollars."

TESTS OF ROLLED STEEL AXLES.

An interesting test of rolled steel axles was made at Pittsburg, Saturday, Aug. 14, under the direction of the Pittsburg Testing Laboratory, Ltd. The axles were manufactured under patents of the new Keystone Axle Co., of Pittsburg, at the company's plant at Morado, near Beaver Falls. The plant has been in partial operation for some months and the favorable results secured at private tests attracted an assemblage of representative steel men to the test mentioned. The Testing Laboratory followed the specifications of the severe drop test required by the Pennsylvania Co. The distance between supports was three feet; the height of the drop 28 feet 6 inches, and the weight 1,640 lbs. The deflections resulting from the first five blows were as follows:

Blow.	Deflection.
1	5 9-16 inches.
2	6 3-32 "
3	6 3-16 "
4	6 21-32 "
5	5 13-32 "

The results show that the physical requirements of the Pennsylvania Co were fully complied with and passed. Other tests were proposed by iron and steel authorities present and all were successfully met.

The illustration shows the roll employed at the plant of the Keystone Axle Co., from which the axles tested came. The roll itself, the most interesting feature, is 98 inches long, 48 inches in diameter and weighs 135 tons. Dies 12 inches thick, corresponding in shape with the surface of the roll, form a background for it and beween these dies and the roll the axle passes. The space is greatest at the top where the heated billet is received and gradually tapers to the dimensions desired for the axle. When this is reached it issues at the bottom of the roll. Steel plates form a background for the dies.

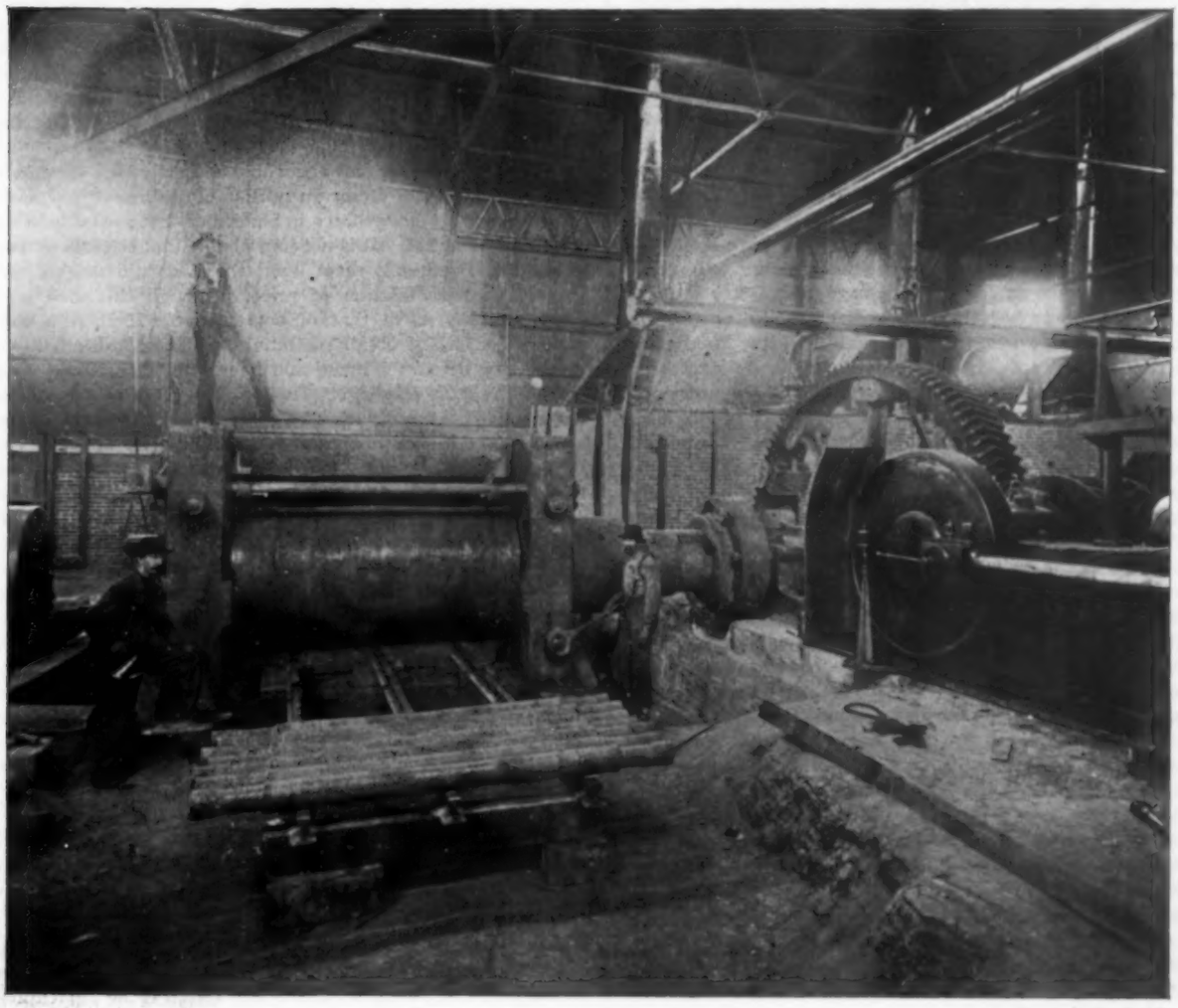
Power is furnished for the plant by an 800 h. p. 24x42 engine, built by the Philadelphia Engineering Co. Brownell boilers of 200 h. p. capacity are installed. The continuous heating furnace has a capacity for heating 60 tons in ten hours. Both coal and natural gas are used for fuel.

The building itself is of steel construction throughout and is 208x80 feet. The location favorable from a shipping standpoint, being on the P., Ft. W. & C. Railroad, and connected with it by a 900-foot siding. The present capacity of the plant is 600 axles in 24 hours. The economies of manufacture make it possible to put this axle on the market at a price considerably below that of forged axles.

The main office of the company is in the Times Bldg., Pittsburg. D. A. Clark is president and Thomas R. Torrence is secretary.

The Spanish Iron Ore Supply.

Great Britain's imports of iron ore from Spain and Sweden continue at a heavy rate. An exchange says that searches are being carried out in different parts of Spain with the view of opening up additional deposits, but that in some cases these have proved exceedingly disappointing. This is especially the case in the south where the quantity of ore available appears to be much less than was originally anticipated. It is estimated that within the next two or three years the exports of Spanish iron ore will only be about two-thirds of what they are at the present time.



TESTS OF ROLLED STEEL AXLES.

THE pneumatic dispatch system between New York and Brooklyn, which has long been planned, is now under construction, and tubes for conveying postal matter from one city to the other are now being laid. The Ingersoll-Sargeant Drill Co., of New York, is furnishing the air compressors to supply pneumatic power for the purpose, and already has orders for several compressors. It will also supply compressors for the plant being installed in Philadelphia.

SOUTHERN EXPORT IRON.

BY WM. B. PHILLIPS.

The export trade in pig iron from Alabama is likely to continue, but is not to be achieved by "whooping it up" without regard to actual and probable contingencies. About 130,000 tons have been exported to European countries during the last six or eight months, and there are orders now booked, or pending, that will involve the shipment of from 10,000 to 25,000 tons more. In some cases these orders have been taken on a norrow margin of profit, but on the whole the prices realized are perhaps as good as if the iron had been sold in the domestic market. Be that as it may, Southern iron producers would do well to consider two things in connection with the exportation of pig iron.

In the first place too great care in grading the iron can not be taken. It must be borne in mind steadily that foreign consumers are much more accustomed to buying iron of uniform composition than has been the case in some parts of the United States. The composition of Eglinton iron, or Clarence No. 3, or Middlesbrough No. 3, is so well established and so widely known that a great deal of exported iron is sold on the understanding that it will be practically the same as one of these irons. Even in the markets of Southern Europe these grades are well recognized. The iron from Alabama must compete with well known grades that have given satisfaction for years, and that can not be displaced without a severe struggle. Just now this struggle is based on the difference in cost between English and American iron, but unless careful grading is insisted upon by our iron men the question of cost will not continue to be the main consideration. If under the growing hope of a good foreign trade at preset prices or those likely to arise during the next several months there should be a relaxation of the rigid inspection so desirable and so imperative, the difference in cost will begin to decrease in importance and the quality of the iron will certainly assume its place. There are two things that enable a new producing district to invade, capture and hold markets that have hitherto drawn their supplies from older districts. These are first, cheapness, and second excellence and uniformity of product. In times of depression the first consideration may and often does play the chief part. But in the long run the secodn cause becomes the more important, as it is certainly the more lasting. If modern civilization has shown any one thing more plainly than another it is that buyers insist upon knowing what they are purchasing. The establishment and maintenance of State and municipal laboratories, supported by the public fund, and operated in the interests of all classes of citizens, is evidence of a tendency that cannot be ignored. One may say that so far these public laboratories are for the purpose of giving information as to the character of food stuffs, principally, and next the composition and value of fertilizing materials, and that they do not concern themselves with other matters. This is true, but does not affect the point at issue, which is, that people now are very much interested in the nature of the things they are asked to buy.

The enormous development of the manufacture of steel, necessitating a close inspection of all the materials required, has reacted upon the foundry and mill trades. If the steel producers can demand and obtain pig iron of a certain uniform quality, suited to the purpose in hand, and derive from its use such evident advantages, why should not the other consumers of pig iron look into the question? There were made in the United States last year 8,623,127 gross tons of pig iron, of which 3,499,899 tons, or 40.6 per cent, was foundry and forge iron, leaving 5,123,228 tons for steel purposes, including 131,940 tons of spiegel and ferro. We have, therefore, practically 60 per cent of the make of pig iron that is liable to close inspection and which for the most part receives it. The users of this 60 per cent have found that it pays them to scrutinize the iron that they make, or buy, and this scrutiny is becoming more and more rigid every year.

"But," says one, "they are makers of steel and must know what they are using. The demand for close inspection of pig iron that is intended for steel purposes is based on the fact that the ultimate product, the steel, is more sensitive to slight variations of composition than forgings, castings and rolled shapes of iron. It is all very well to talk about analysis, but when it is proved that a laboratory is as necessary to a mill, or a foundry, or a forge as it is to steel works, it will be time enough to demand an analysis attached to the bill of lading."

Now the sufficient answer to this is that that time has already come, and that in the hands of intelligent, progressive men, fully alive to all the exigencies of their business, the information to be gained from a well-conducted laboratory connected with mill, or foundry, is as valuable as to any other branch of the iron business. The question is not whether the slight variations in the composition of steel render the chemist indispensable, but whether any variations do. If this be the case, if it is true that chemical knowledge is required as to any variation, to say nothing of the many, then the chemist is necessary. Apply this course of reasoning to the mill, or foundry, and observe whether or no it is applicable. If it is, there is no use in discussing the matter further; if it is not, then chemical science is a humbug and the chemist himself a charlatan.

It has been said that 40 per cent of the pig iron made in the United States goes to the mill, or foundry, or forge, coming out as iron, and not as steel. This applies to the country at large. If we consider the Southern States alone the proportion is far greater. These States made last year 1,834,451 tons of pig iron, and of this amount a liberal estimate would indicate that 100,000 tons were diverted from the mill and foundry. In other words, of the iron made in the Southern States, probably 95 per cent went to the mill, or foundry. These States furnished about one-half of the mill and foundry iron made in 1896, but only a little more than one-fifth of the total production of pig iron.

It is to these States that one would naturally look for movements affecting the closer inspection of ordinary grades of pig iron, and to those States in particular that are cultivating the foreign market. It is not improbable that the sale of iron abroad will eventually react upon the domestic market, not so much in the direction of price, although this also may come into play, as in that of composition. If foreign consumers ask for and obtain quotations as to composition, it will not be long before the home consumer will be insisting upon having the same privilege. He is diplomat enough to believe in "the most favored nation" clause in international matters, and to see to it that this principle maintains as between the foreigner and himself. It would not be the first time in the history of the iron trade that sales abroad profoundly affected sales at home, for the average American is prone to think that nothing on earth is too good for him. If our friends across the water have a good thing, we get it, and if possible improve it. If they know what they are buying we want to know what we are buying.

The export trade in pig iron seems to have come to stay. We sincerely hope it has, and that the longer it stays the bigger it will grow. The exports of pig iron from the United States since 1867 are given in the following table, in gross tons:

Year	Tons.	Year.	Tons.	Year.	Tons.
1867	624	1877	3,180	1887	6,796
1868	281	1878	5,781	1888	14,356
1869	61	1879	3,048	1889	13,573
1870	1,390	1880	1,871	1890	16,341
1871	3,498	1881	6,157	1891	14,945
1872	2,026	1882	5,576	1892	15,427
1873	2,816	1883	3,768	1894	24,587
1874	9,641	1884	3,840	1894	24,480
1875	15,797	1885	6,228	1895	26,164
1876	6,792	1886	8,849	1896	61,071

For the first half of 1897 the exportation of pig iron from Alabama alone was about 120,000 tons, and it is perhaps fair to estimate that the total exports of pig iron from the United States in 1897 will be in the neighborhood of 275,000 tons, or possibly 300,000.

The bulk of the exports will be from the Southern States, for it is here that the cheapness with which iron is made renders possible the long haulage to the sea-board and transportation to foreign countries. But this trade can be held only by catering to its demands and when the difference in price as between American and foreign iron becomes less then the question of composition will certainly come to the front. That all of these demands will be met no one who has studied the trade can doubt, but producers must be ready to seize their opportunities, and to lead the trade, not to follow it.

Birmingham, Ala.

WESTON Furnace, at Manistique, Mich., started up on Saturday, Aug. 7, and has been working excellently.

TOPICS OF THE FOUNDRY.

Philadelphia Foundrymen's Association.

The first meeting of this association since the summer vacation and the 70th in the history of the organization, will be held at the Manufacturers' Club, Philadelphia, Wednesday evening, Sept. 1. The programme includes an address by Mr. I. Roberts Newkirk, superintendent of the foundry department of Wm. Wharton, Jr., & Co., Inc., of Philadelphia, subject, "Casting Street Girder Rail Joints Together." This is the new process of pouring iron around joints of rails on trolley lines. The cupola in this case is mounted on wheels and is hauled to the place where the pouring is to be done. In other words it is a foundry plant complete on wheels. The plant will be shown at work. It is a new departure in foundry practice and Mr. Newkirk has had a varied experience in the process. There will also be a discussion, going into the present condition of the foundry trade, as compared with two months ago. The object is to put alongside the newspaper accounts of improvement the actual experience of foundrymen.

Chemistry in a Gray Iron Foundry.

A large agricultural machinery concern in the West sends *The Iron Trade Review* the following, giving its experience with chemistry in the foundry and indicating in a general way its method of regulating mixtures:

"With us the services of the chemist are employed to determine in the material used for the production of castings, the percentages of the various elements usually occurring and which affect the quality of the castings. From the data so obtained we regulate the mixture to produce a desired composition in the ultimate casting. The benefits derived from the employment of the chemist are, a more uniform and constant product of desired physical properties; a better quality and more uniform composition in the raw materials, due to the fact that the concerns supplying these materials become aware of the employment of a chemist by the purchaser.

"It cannot be said that absolute certainty regarding the quality of castings is secured by the employment of a chemist. There are some things about the chemistry and manipulation of iron not yet understood, and there are occasions, consequently, where we are at a loss to explain results obtained. This is the exception, however, and not the rule. This being so, we find good results obtained from the employment of the chemist and believe these exceptional cases are an additional argument why the chemical study of iron should be proceeded with, rather than against it. We do not lay down any hard or fast rule in specifying what the composition of our iron shall be. We vary at times the composition of the different grades of iron that will be acceptable to us, this depending upon the opportunities of the market and the analysis of the irons we propose using other than the particular iron that happens to be in question. For these reasons our ultimate castings are not always of the same composition, because irons of different analysis will produce the same physical properties and after all our interest in chemical composition is only as it affects physical properties. The only generalization we can make in the matter of analysis is that in all cases we desire the sulphur to be as low as possible."

Indenture for Manual Training School Graduate.

At the last meeting of the Western Foundrymen's Association, the report of the committee on apprenticeship was submitted, with forms of indenture for various classes of apprentices. Inadvertently the form for graduates from manual training schools was omitted. It provides for a three year apprenticeship, with a fourth year, in case the apprentice desires to learn loam molding. The pay provided is $6 a week for the first year, $7 a week for the second, $8 a week for the third, and $10 a week for the fourth. The allotment of work for the various years is as follows: "The first three months of the first year shall be spent in working at the cupola, in order to gain some knowledge of the melting and mixing of irons, and to learn to take care of the cupola and ladles; the next six months to be spent working in the core-room; and the last three months of the first year to be spent at bench molding. The second year is to be devoted entirely to molding, the apprentice to be advanced from the small and plainer work to the more difficult and larger, as fast as his capabilities prove it advisable. The third year to be devoted to the most responsible work in the shop, either in green or dry sand, as the apprentice's capabilities may justify. Should he desire to learn loam molding it will be necessary for him to devote one further year to this special branch of the trade."

IMPROVEMENT OF RAIL STEEL.

In the rush of orders incident to the drop in rail steel and the extremely low prices at which contracts have been taken, there are elements of danger to the purchaser of rails which should not be overlooked. The tendency to cheapen the cost of production of late years has caused the use of larger ingots, faster running mills and higher heats in rolling. Partly to counteract the effect of these undesirable features of rail making, higher carbon has been introduced into rails. While high carbon, with low phosphorus and sulphur and medium silicon and manganese, will produce a good rail steel with proper heat and mechanical treatment, yet the methods used in some of our mills are not all they should be to produce good high carbon rails.

The rails of about 20 years ago, made of small ingots, with slow running mills, show much better results than the late higher carbon rails. That this fact is largely due to the small sections I think the unprejudiced mind will admit, yet the other influences were no doubt factors in determining the good qualities. We may use manganese, phosphorus or silicon as hardeners, but carbon is the most reliable and produces the best results, the other hardeners producing brittleness, except perhaps silicon, which has been known to go to 0.3 without this effect.

The chemical, mechanical and heat requirements for a good rail are pretty well known, yet it may not be amiss to recapitulate here. The chemical composition should be: Carbon, 0.45 to 0.70; silicon, 0.10 to 0.15; manganese, 1.00 to 1.30; sulphur, not over 0.07; phosphorus, not over 0.07. These are close figures but vary some according to the weight of rail. The mechanical requirements are that the rail should have as much work as possible done on it by the rolls; to this end the billet should completely fill each pass, and with a quick running mill a large number of passes should be made to produce a good rail. Heat treatment is most important. The chemical reaction should be completed in the converter, the charged material be of a uniform composition, molds should be warm, not stripped too soon, ingots reheated in a vertical position, and no cinder heats allowed.

Rails, after rolling, should be cooled, so as to admit of an even texture in the material. Especially is the last condition essential for a strong rail and a good wearing head. It has been found that the top of the head of an ordinary steel rail, just below the surface skin, is much softer than the web or base of the rail. This is exactly as it should not be, as the head should naturally be hardest for wear. The general opinion of experts on both sides of the water seems to be that flaws are generally produced in rail steel by segregations of injurious constituents or by pipes and blow holes, these being partly dependent on such segregations.

A good rail cannot be produced from an unsound ingot. As we cannot generally see ingot flaws, there seems but one way to effectually get rid of them and that is by a modified Whitworth hydraulic compression method of treating the fluid ingot steel. This method has been applied so successfully in many ways in the production of sound steel, that its general introduction in rail making would not be altogether experimental.

My next suggestion is of the after treatment of the rails from the hot saws. With proper appliances, the cambering machine might be done away with, the rail held straight in a tempering oven or on a table and the heat abstracted more rapidly from the head than from the base and web, keeping all parts at nearly uniform temperature, thereby producing a uniform texture or giving a head of equal hardness and elasticity with the web and base. It might be found desirable to temper the head harder than the base and web, but I doubt if this would result in as safe a rail, or one of as generally good quality. It will be noted that these suggestions are on practically the Alpha and Omega of rail steel manipulation. That some gagging would be required after cooling is probable, but this would undoubtedly be small.—[Engineering and Mining Journal.

CASTING A DIFFICULT METAL.

BY "CUPRUM."

Copper, with the addition of from eight to 12 per cent of aluminum, is one of the most difficult metals to cast. Yet there is an incentive to overcome the obstacles to success, in the fact that the combination makes one of the strongest metals known, and is therefore particularly adapted to positions calling for severe service. The difficulties arise from shrinkage of the metal and from the formation of a film of aluminum oxide on the top of the metal when exposed to the air. Foundrymen do not have much trouble in overcoming the first, as provisions can be made for risers for the heavy parts of the castings, but the other drawback is more serious and has discouraged many. Secondary pots provided with an outlet in the bottom through which the metal may be drawn

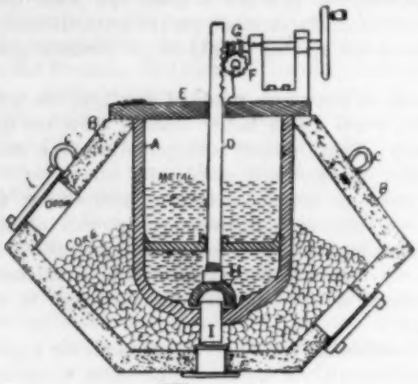


Fig 1

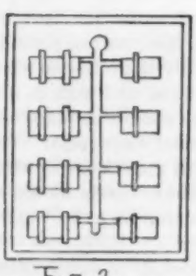


Fig 2

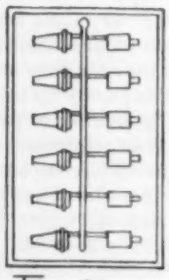


Fig 3

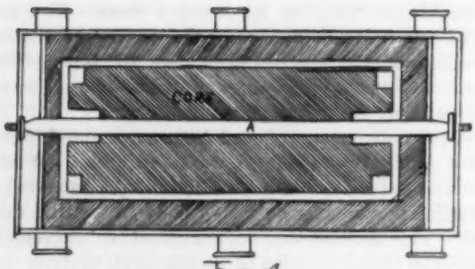


Fig 4

CASTING A DIFFICULT METAL.

and passed to the pouring gate without contact with the air, will in a great measure overcome oxidation of the metal. Yet it is not unusual to see the oxide form and a film work its way into the mold with the flow of metal even when secondary pots are used. This film is injurious to any casting. After having tried many ways to get perfect castings the writer departed from usual methods and succeeded in obtaining some good work.

Fig. 1 shows the pattern of the crucibles I had made. The inner crucible A, is provided with a pouring neck I, shaft D, cup A, and appliances for operating it. The latter consisted of worm and gear at G and F. These are turned by hand and the shaft and cup raised or depressed at will. The turning mechanism is fixed to the lid E and both lid and mechanism are removed while the crucibles are in the furnace. The outer crucible B, is provided with rings C, C, and chain and tackle are employed for removing the crucible from the furnace to position over molds. Graphite crucibles were used, annealed at 300 F. at even temperature, until moisture was expelled, and this was followed with glazing by a succession of quick heats.

Metals in almost any form can be bought ready for melting and casting. I found that some of these did not meet the requirements. Some bars of aluminum bronze seemed to be chiefly brass. The most effective grade of bronze metal developed a tensile strength of 78,000 lbs. per square inch and contained 11 per cent of aluminum in copper. I employed a common melting furnace, burning charcoal, and sustained the heat, after lifting the melting device, by means of a coke fire in the space between the crucibles.

Fig. 2 shows the method used for casting a number of small bushings. This grade of metal is particularly useful for small bushings that are subjected to high speed, and extraordinary conditions. The runner is molded half in the cope and half in the nowels. The cope is rammed up, top levelled off, the mold gated and vented in the usual way. Fig. 3 shows the system of gating some small pipe unions.

Fig. 4 is a sectional view of an outfit employed for casting a large roll or cylinder for a paper mill pulp conveyer. Usually such rolls are cast in a sand mold and considerable expense is gone to in turning the surface. The view shows a half of the chill and the core. A steel shaft A is adjusted as shown, and this is cast to the roll. A union is formed later by means of keys or the steel shaft can be slotted or drilled at the juncture of the flange of the roll, into which the metal will run and form a joint. The pouring is done from the top. To pour this metal from the lip of an open crucible would, as intimated above, produce castings defective in many respects. But by pouring it from the bottom of the device shown in Fig. 1, the writer has seldom failed to get good castings.

Shipments of Cuban Iron Ore.

The *Bulletin* of the American Iron and Steel Association says: "The Juragua Iron Co., Ltd., of Philadelphia, advises us that on Aug. 3, the shipments of iron ore from its mines in Cuba passed the 3,000,000-ton mark, the steamship William Anning having left the Cuban port of Santiago at seven o'clock on the morning of the date named with a cargo of ore which carried the total shipments by the company past the third million. The first shipment of iron ore made by the Juragua Iron Co. from its Cuban mines left Santiago on Aug. 7, 1884, in the steamship African. On Aug. 19, 1890, over six years later, the steamship Earnwell, carrying cargo No. 404, sailed from Santiago, her cargo completing the first million tons of ore shipped from the company's mines. Almost three years afterwards, on July 25, 1893, the second million mark was passed, the shipment being cargo No. 765, forwarded in the steamship Hopetoun. As above stated, the steamship William Anning, carrying cargo No. 1,083, which completed the third million left Santiago on Aug. 3, 1897, over four years having elapsed from the time the company passed the second million ton mark to the time the third million mark was reached. We understand that the shipments of iron ore by the Spanish-American Iron Co., whose mines are near those of the Juragua Iron Co., have probably been larger in the last few months than at any previous time in its history. The Sigua Iron Co., which also owns iron ore mines in the vicinity of the Juragua and Spanish-American properties, has not mined any iron ore since 1893."

The total shipments of iron ore from Cuba to the United States, from the opening of the mines there in August, 1884, to the end of December, 1896, were 3,034,504 gross tons.

BRITISH Consul Lowther's report on the trade of Yokohama, in 1896, shows that in the supply to Japan of bar iron and rods Belgium takes the lead, while in the supply of other iron and steel Great Britain retains the first place. The report draws attention to the new and growing competition of the United States, which sends there wire nails at a lower price even than the European continent. While the quantity did not come near that sent by Germany, it was about equal to that of Great Britain and Belgium together. Pig iron and rails are also beginning to be imported from the United States. Orders for other railway material are shared between Germany, Belgium and England.

CASTING GEARS IN BAKED MOLDS.

At the Hartford meeting of the American Society of Mechanical Engineers, Mr. Gus C. Henning spoke as follows in the discussion on gearing:

I think a word ought to be said in favor of cast gears, if they are made in the proper manner. As cast gears are generally made when hot metal is poured in, the result is anything or nothing—cracked gear or anything else. The strength of such gears cannot be determined e cept accidentally. But there is a way of making cast gears so that they will be nearly as good as the best cut gears, and it is a very simple way. Take a cut pattern and mold it up in a material that will bake pretty hard, then leave the gear right in the mold, and put the whole flask and pattern in the core oven and bake it. The result will be that, as clay or sand expands less than metal, the expanding metal pattern will crowd the sand so that upon cooling, the pattern will lie loose in the mold, and it can be taken right out. The cope is then put on, and before the flask is cold the metal is poured into the flask, which is free from dirt or dust. The dust can be blown out with a blower if it is necessary, but there really is not sufficient dust in the flask to hurt the casting. The metal is put into the hot flask and the result will be gear which is sufficiently good to run in a printing press without any noise. These gears are used on printing presses, and people who use them do not know that they are not cut gears, because if the cut gear used as a pattern has the slightest tool mark on it those tools marks will appear in the casting. Such gears are used at the present time. I think the patent on this method expired long ago. Such gears are strong. As the mold is hot when the metal is poured in, the shrinking or cooling strains are less, and the metal is not chilled so rapidly when it reaches the mold. It is, of course, chilled, but not so fast; and, besides, the hot flask, with all the material in it, helps to anneal the iron during the cooling process, so that an almost uniform condition of metal is obtained in the gear. In ordinary cast gears there may be anything but a true gear. There are shrinking and cooling strains, possibly a bad core, slight cracks in the corners, even though they are not true shrinkage cracks; there are surface shrinkage cracks which are, I think, generally disregarded, but they are of importance in considering the strength of a gear. Some loose material will perhaps get in the surface of the gear, and as soon as the metal begins to wear down it will wear badly. There are other reasons why an ordinary cast gear is never as strong as the formula indicates; and all formula, except when applied to cut gear or annealed gear, should be empirical rather than rational, for the reason that the factor of uncertainty cannot be readily applied to a mathematical—a rational—formula any easier than determining a few strengths of different gear empirically, and then using a formula constructed on those results as a basis. But the method which I have described will give satisfactory results, and can be used for large and small gears with equal facility. These gear patterns require no taper, because the metal expands very much more than the surrounding material, and they can easily be lifted out without any trouble whatever, and the material surrounding the pattern being baked hard, of course, has considerable strength, especially when the material has been saturated with some baking material or substance. There will be no difficulty whatever in doing that, and a gear will be obtained which is equally strong in all parts and one which operates with uniformity. Anyone who has seen printing presses run knows how perfect these gears must be in order to run smoothly for long periods of time without the slightest interruption.

I know of gears 48 inches in diameter having been cast that way, which ran perfectly, and the pitch line did not change, because when the material begins to cool down sufficiently to be a solid mass the clay or sand begins to cool off with it and the two go together. In the first place, the pitch diameter was changed by the expansion of the gear in the mold; but originally that clay was tight to the wheel, and, on the other hand, the molten metal coming in will shrink a little more than the mold will afterwards, so practically they are the same thing. The gears cannot be heard when running, any more than cut gears. If that is true, the gears must certainly be run together so nicely that the variation of pitch diameter is immaterial. They can be seen running on all of the new presses of the Walter Scott Co., in Plainfield, N. J. They are putting them on all presses now, since about two years, and no one knows that he is using cast gears instead of cut gears, because they give the same satisfaction. They are experimenting now on larger gears.

He does not pay much attention to the shape of the flask, because there is always so much packing material around the pattern. I believe he is guided by the size of his baking oven. If he can get the flask in the oven, he takes a flask of that size.

By-Products in Coke Making.

The chief of the by-products utilized by the by-product oven systems is ammonia. Hitherto the sole source of supply of ammonia in the United States was in the illuminating gas plants, but the use of electricity and of water gas has decreased the production of the article while the demand for it has been on the increase. Ammonia has many uses. It is an essential material in ice manufacturing, in electrical batteries, in chemical manufactures, and in the manufacture of fertilizers it is substituted for nitrate of soda. The yield of ammonia from regular coking coal is about 20 pounds per ton of coke produced, and at the minimum value of $20 (£4) per ton this product alone would be worth 20 cents (10d.) for each ton of coke.

Two kinds of gas are obtained from coal by means of the retort coke oven system. These are illuminating gas and manufacturing or fuel gas. The latter makes a very good substitute for natural gas. The production of illuminating gas in the retort oven involves a change in the operation of the oven, so that ordinarily produced gas, with the recuperation of both gas and air, may be burned in the flues instead of the rich coke oven gas. It has been estimated that for each ton of coke produced, upward of 8,000 cubic feet of gas are given off, and the entire product yielded annually in the United States by the coking of coal, allowing one-half of the product to be consumed in the coking process, is upward of 60,000,000,000 cubic feet, or but little less than one-fourth of the annual natural gas production during the height of that excitement.

By-product oven tar is superior to the tar which comes from the gas works. It contains less pitch. The yield for each ton of coke varies from 40 to 100 pounds, according to the amount of volatile matter contained in the coal. It has a fuel value equivalent to $5 (£1) per ton, or that obtained by coking a ton of coal is worth from 10 to 25 cents (5d. to 1sh.) As a roofing and paving material this tar has a value of about $8 (£1 12s.) per ton.

As a material for the manufacture of fuel briquettes, coke oven tar stands pre-eminent. In addition to the above uses, this tar, after passing through the complex processes of modern chemistry, comes to us in form of analine dyes, saccharine, benzol and other products.—[William G. Irwin in Cassier's Magazine.

THE Jeffrey Mfg. Co., of Columbus, O., manufacturer of coal mining machinery and other specialties, has just received a letter from Mr. S. W. Farnham, mechanical engineer of the coal companies of St. Louis, enclosing a report from Mr. James Cameron, superintendent of this company's No. 2 Western Coal & Mining Co.'s mine, located in Arkansas. In this report Mr. Cameron states that at this mine with a Jeffrey electric machine equipped with self-propelling truck, 95 cuts were made in nine and a half hours, on Aug. 13. This record was made by two men, all cuts being made with the same machine. The work was done in five rooms and two entries and necessitated the changing of bits a number of times. It was necessary to load and unload the machine seven times. This run exceeds any record made in this mine and thus far there has been no report from any mine in the United States of such a record. The special records reported for various machines have been made where several separate machines were set ready to do the work and the number of cuts made by all machines counted, one set of men moving quickly from one machine to another and thus saving the loss of time incident to moving machine from room to room or from one entry to another. Strength of construction and capacity of motor are the points emphasized in the Jeffrey machine.

OBJECTIONS TO THE CHAINLESS BICYCLE.

Dr. R. C. Carpenter, professor of experimental engineering at Cornell University, has been doing a great deal of experimental work in an endeavor to find the relative merits of a bicycle driven by a chain and one of the chainless variety. His deductions are interesting. He says:

"Our investigations are not entirely completed at the present time, but it seems safe to announce that all the tests indicate that no form of gearing can possibly equal the best chain for efficiency and durability. Some of the results of the tests may be interesting, and it may be briefly stated that the friction with the best chain varied from one-half to three-quarters of one per cent, and this result was obtained with a chain which had been in use on a wheel that had been ridden for more than 2,000 miles by a rider weighing nearly 200 pounds. This would serve to show that high-grade chains can be and are made which do not change their form by wear an amount sufficient to effect the friction. Tests were made on a large number of other chains and the friction was found to vary from two to five per cent, depending upon the condition of the chain, the method of construction and details of the design. The highest friction we have found, even in the case of an old chain, which did not fit the sprocket properly, did not exceed ten per cent, although I am willing to concede that a considerably higher friction might in some instances be found.

"Regarding the use of gears, extensive investigations have been made from time to time which show the amount of power lost in friction. The very best recorded results with spur gearing are very nearly equal to those obtained with the ordinary chain when the gearing is in the best condition and working accurately in line and position. The best kind of bevel or spiral gears, a form which must be used in bicycle work, show about three times the friction of the spur gears, and since two pairs must be used on each bicycle, about four times as much friction as the ordinary chain will be developed, and six to eight times the friction of the very best chains.

"There is another serious objection to the use of gears arising from the fact that the least change in position of the point of contact of the gear from its normal will cause a great increase in friction and in loss of power over that stated in the preceding discussion. This indicates that the gearing is essentially unfitted for a frame which must from the very nature of its use possess great elasticity and flexibility.

"In our investigation the friction of several bicycles running under ordinary conditions was measured. This for the very best wheels under heavy working condition was found to be from five to eight per cent of the power supplied, while with some of the poorer wheels the friction was 20 to 40 per cent.

"One of the noted manufacturers of high grade wheels kindly permitted an opportunity of comparing a chainless wheel, which was constructed in the most approved manner, and with the friction reduced to the smallest possible amount, with the same kind of wheel equipped with the best chain. The results were uniformly from five to eight per cent in favor of the wheel with the chain, or just about the amount that could have been predicted from previous tests of gearing.

"The chainless wheel also developed one extremely bad feature, and as this is inherent in all methods of gearing, it may be perhaps worth mentioning. With all the chain wheels the percentage of friction or loss of power remained essentially constant at all speeds, but with a geared or chainless wheel the percentage of friction increased as the speed diminished. This would make the chainless wheel very ob-jectionable for climbing hills, since at that time the speed must be slow and all the power of the rider must be used to propel the wheel forward."

DAVID B. CARSE has resigned as general manager of Greenlee Bros. & Co., of Chicago, to become president of Carse Bros. Co., Chicago. His brother, John B. Carse, now representing Thomas Kane & Co., Chicago, in the machinery business in England, will return and take a position with the new company.

THE statement of British pig iron stocks show: 728,730 tons on Aug. 1, against 968,139 on Jan. 1, a decrease of 239,409 tons.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The F. B. Tait Mfg. Co. has been incorporated to manufacture agricultural implements at Decatur, Ill., by Felix B. Tait, Richard W. Essick and Daniel W. Tait.

The Anchor Iron Fence Co., capital stock $40,000, has been formed at South Haven, Mich.

The Valdosta Foundry & Machine Co., Valdosta, Ga., is in the market for a boiler punch and shear combined, with not less than 36-inch throat and strong enough to punch seven-eighths holes in one-half inch plates.

W. W. Wagner, Brownsville, Tenn., is in the market for a good second-hand medium-sized 10 or 12-inch stroke shaper and a medium-sized drill press, with back gear.

The Auburn Wagon Co., Martinsburg, W. Va., will buy a second-hand iron turning lathe, with 20 to 24-inch swing, six to eight feet bed, screw-cutting and screw feed, four-jaw independent chuck, one small and one large face plate, with steady rest lathe and countershaft, with tight and loose reverse pulleys.

New Construction:—

It is reported that the National Tube Works Co. will enter on the manufacture of seamless tubing at Christy Park, a suburb of McKeesport, Pa., and is now at work on a plant of considerable size. Several buildings are completed ready for machinery. The works will probably be in operation by Jan. 1.

The Chicago Screw Co., of Chicago, Ill., will build a factory to cost $50,000. The building is to be 175x200 feet, three stories.

The H. W. Johns Mfg. Co., will erect at Chicago Heights, near Chicago, an important plant for the manufacture of pipe covering and asbestos for general purposes. Specifications have been prepared for three buildings. One will be two stories, 80x260 feet, devoted to manufacturing, equipped with a power plant of two steam boilers and a 125-h. p. engine. Two one story warehouses will be erected, one 80x96 feet and the other 80x224 feet.

Preparations are being made by the National Chuck Co., Oneida, N. Y., for the erection of a new plant.

The Central Iron & Steel Co., of Brazil, Ind., is building a new spike mill 65x100 feet, and making repairs in other departments.

The Connersville Elevator Co., which is engaged in building one of the new steel elevators at Buffalo, will build for the Canadian Pacific Co., at Ft. William, an elevator of 1,500,000 bushels capacity, the work to be completed in February.

A machine shop, foundry and boiler shop will be erected at Toronto, O., by Jesse Furner & Co., of Cambridge, O.

Work of construction has begun on a duplicate of the steamer Starucca, also for the Union line, at the Union Dry Dock Co.'s yard in Buffalo, but the rumor of preparations at the Union yard for the construction of a 600-foot dry dock is premature. Such a dock was projected last year, and would have been built then but for the need of the space for something else. It will be built sometime, and that is all the authorities will say about it now.—[Marine Review.

The hot mill building of the National Tin Plate Co.'s new plant at Monessen, Pa., 100x500 feet, is near completed. The tin mill building, 70x350 feet, is under way.

The Atlanta & West Point Railroad and Western Railway, of Alabama, will rebuild its burned shops at Montgomery. Plans and specifications have been prepared for a new plant to consist of a machine shop 110x100 feet, transfer table 45x115 feet, boiler shop 50x80 feet, blacksmith shop 50x80 feet, storehouse 30x75 feet.

It is now stated that the new steel plant talked of at Greensburg, Pa., will be built near Leechburg, Pa. The parties interested are Capt A. Hicks, J. W. Kirkpatrick and J. L. Kirkpatrick. Work will be commenced at once.

The Union Malleable Iron Works, Moline, Ill., is erecting gas producers to operate its annealing ovens. A brick addition has been made to the engine room and a much larger engine installed.

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Additions, Enlargements, Removals, Etc.:—

The pattern shop now in process of building for the Graham Bros.'s foundry, Newark, Cal., is nearly finished.

The United States Radiator Co., West Newton, Pa., has received a number of good orders lately. The company has purchased additional ground and is planning to enlarge the plant.

The Dubois Iron Works, Dubois, Pa., will add a blacksmith shop and a foundry to the present plant.

The Hamilton (O.) Tool & Construction Co., it is reported, will remove its factory to Libertyville, Ill., on the Chicago, Milwaukee & St. Paul Railroad. Plans have been prepared for a two-story brick building, 60x140 feet.

Lewis & Allen, manufacturers of vehicle springs, Jackson, Mich., will build an addition to their factory, 50x150 feet, for the purpose of making vehicle axles. Engine and boiler rooms will also be built.

C. R. Baird & Co., of Philadelphia, have bought the Danville Nail Works, at Danville, Pa.

General Industrial Notes:—

The National Tube Works Co., McKeesport, Pa., has posted a notice that on Aug. 30 wages will be advanced, practically restoring the ten per cent reduction made March 8, 1897. The management says that while the price of pipe has not advanced there is an improved tone in the market and the company advances wages on the strength of this.

Moorhead Bro. & Co.'s Vesuvius Iron & Nail Works, at Sharpsburg, Pa., which has not been running full for several years, has added to its force recently and is now working double turn. The tonnage ahead is not heavy but will keep the force working steadily for some time. Considerable business in iron is offered, but the company finds prices the lowest.

The foreclosure suit of the Ironton Structural Steel Co. against the Ironton Land Co., at Duluth, was decided in favor of the land company. On the $50,000 bonus promised by the land company, there was due a balance and a note and $27,000 mortgage were given. The court held that as the steel company did not operate its plant and thereby given an increased value to the land company's property, it have given no consideration for the note and mortgage and therefore these were void.

The Union Rolling Mill, Cleveland, idle for eight weeks pending wage settlement and repairs, started up Monday in the puddling mill and the finishing departments are now running.

The Bucher & Gibbs Plow Co., Canton, O., is now doing the largest business in the history of the establishment, though at the lowest prices.

The Canton Bridge Co., Canton, O., has good orders on hand and is much busier than in 1896. The works would be on double turn if orders for steel were filled. The Wrought Iron Bridge Co., of Canton, has more orders booked and more inquiry than in several years.

With a determination to be in the front in all matters pertaining to their special lines of work, the R. D. Nuttall Co., of Allegheny, Pa., has just placed in its factory one of the Gleason Tool Co.'s latest improved types of bevel gear planers. The company is now prepared to add theoretically correct gears in this line to the other types of gears it has manufactured. A gratifying condition of trade is noted by the R. D. Nuttall Co., with the outlook for fall business very bright.

The personal property of the Lebanon (Pa.) Rolling Mills, was sold at public sale by the assignees to the J. Lansing Mines Co., of Philadelphia. The Lebanon Rolling Mill Co. was formed with capital stock of $175,000, with the following officers: President, Samuel E. Light; treasurer, Richard Meily; secretary, Jas. Roberts; directors, C. R. Baird, J. Lansing Mines, G. W. Nicolls and W. H. Leonard, of Philadelphia, and A. Hess and Samuel E. Light, of Lebanon.

The new furnace of King, Gilbert & Warner, Columbus, O., is in blast.

The receivership suit of stockholders of the Irondale Iron & Steel Co., whose tin plate plant is at Middletown, Ind., has been dismissed. Geo. A. Laughlin, the president, whose conduct of the business including extensive additions, was not satisfactory to some of the stockholders, bought the holdings of the objectors. Mr. Laughlin secured for the company a considerable line of credit and a majority of the stock was transferred to him on that account. The capital stock is $150,000. The value of the plant and gas leases, etc., is $246,000, and of accounts and bills receivable, $60,000. The bonded debt is $75,000 and the floating debt $173,000, including $75,000 to the Illinois Steel Co., $30,500 to B. P. Crane & Co., and $44,000 to banks in Wheeling and Cleveland.

The Lake Shore Iron Works, at Marquette, Mich., of which S. H. Holley is general manager, are shipping saw mill machinery over wide territory, having customers in the Atlantic States and along Puget Sound. The company also does an extensive business in mining machinery, and is engaged in manufacturing machinery and supplies for quarrying stone. It has recently begun the manufacture of gasoline engines for light power and for operating launches or yachts. Crushers recently installed at Marquette range iron mines were built at this plant.

W. S. Rockwell & Co., New York, have just completed the installation of an oil burning plant for the enameling department of the Eastern Tinware Co., Portland, Conn.

The C. H. Gurney Co., dealer in heavy hardware at 247 Lake st., Chicago, was closed by the sheriff last week on a judgment obtained by Henry Stern. The liabilities are set at $60,000, with assets a little larger.

The Bloomsburg Mfg. Co., Bloomsburg, Pa., which suspended June 8, a trustee being then appointed, will be reorganized within 60 days.

The Genesee Valley Mfg. Co., of Mt. Morris, N. Y., has received an order to ship a carload of its drills to Genoa, Italy.

The Rider-Erricson Engine Co., at Walden, N. Y., expects to resume operations on Sept. 1.

J. Wood & Bros. Co. is about to erect a three-high 72-inch mill in its iron plant at Conshohocken, Pa.

The Norwalk Iron Works, South Norwalk, Conn., manu-

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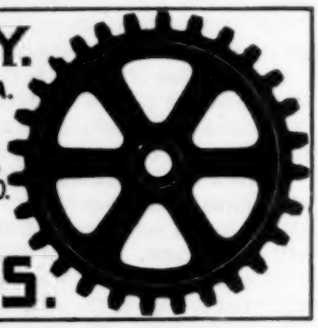

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MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.

facturers of air compressors, are filling orders from Russia. They will run a full force of men ten hours a day.

The Warren Foundry, Flint, Mich., has been sold to McCorkle & Hurd, who expect soon to carry on business at that location.

The Iowa Iron Works, Dubuque, Iowa, has secured from the United States Government a contract for building a steel steamer to be used in making river improvements.

Wm. R. Martin has lately purchased the entire stock and pattern of the old Eden foundry, and has moved them to his new foundry plant, North Charlotte st., Lancaster, Pa.

The Brush Electric Co., Cleveland, has made the final shipments of manufactured and raw materials, machine tools, etc., to its eastern plant. The Cleveland works belonging to the company as heretofore stated are now partly occupied by tenants engaged in metal working and other manufacturing, but some well equipped shops are still to be let.

The Valentine Iron Co.'s plant, at Bellefonte, Pa., was closed down Aug. 20 for repairs.

Some improvements will be made at the Akron Steam Forge Co.'s Elwood, Ind., plant.

The Sharon (Pa.) Boiler Works have shipped to Vera Cruz, Mex., 10 2,000-gallon iron tanks, to be used in making molasses.

The Collins Plow Co., Quincy, Ill., is full of orders for plows and hay presses.

The No. 2 puddle mill of the Brown-Bonnell Iron Co., Youngstown, O., has been started, after an idleness of many months.

The Union Iron & Steel Co., Youngstown, O., will start its Warren, O., mill on skelp iron. The mill has not been operated since April.

The Alabama Rolling Mill Co. has sold a bill of sheet steel to Walsh & Weidner, of Chattanooga. This is the first consignment of Southern sheet steel made from ingots cast in Birmingham. The rolling mill company has already turned out bar iron from its own steel, and the behavior of the product under the rolls and its strength as shown by breaking tests, are all that could be desired.

The stove foundries at Quincy, Ill., that of the Comstock-Castle Stove Co., and others, are running full time with full forces.

The Conshohocken (Pa.) Tube Co., which went into the hands of receivers last April, has been reorganized and will resume business at once under the new management. The officers of the company are: President, Jawood Lukens, Conshohocken; secretary and treasurer, Lewis A. Lukens, New York; directors, John Pugh, H. M. Tracey, Albert L. Murphy,

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Some SECOND-HAND TOOLS in stock.

1—8-ft. Boring Mill.
1—No. "D" Horizontal Boring & Drilling Machine.
1—Garvin Profiler.
1—A. T. & M. Co. Valve Milling Machine.
4—No. 11 Brown & Sharpe Milling Machines.
2—No. 1½ Stiles Presses.
1—No. 3 Stiles Press.
1—36-in. G. & E. Spur Gear Cutter.
2— Crank Planers.
3—No. 1 Brown & Sharpe Screw Machines.
2—No. 6 Brown & Sharpe Screw Machines.
1—36-in. Car-wheel Borer.
1—55-in. Pneumatic Riveter.
1—30-in. Pulley Lathe.
1—Pratt & Whitney Turret Lathe.
1—109-in. Engine Lathe.
1—15-in. Fox Turret Lathe.
1—20-in. Lodge-Davis Turret Lathe.
1—20-in. x 10-ft. Gleason Engine Lathe.
1—24-in. x 12-ft. Gleason Engine Lathe.
1—3-Spindle Drill Press.
2—30-in. Drill Presses.

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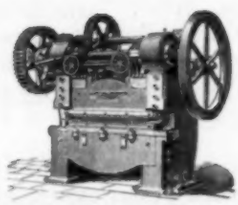
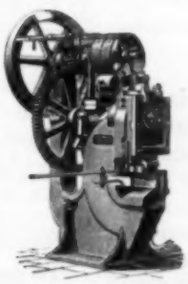
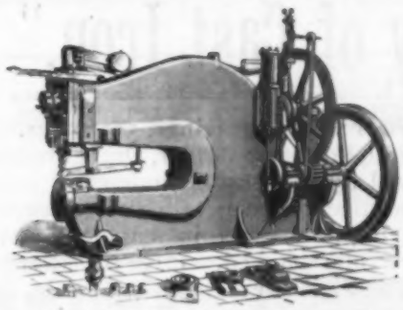
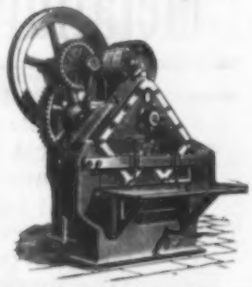

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Conshohocken; John S. Gerhard, Philadelphia; William Wilson, Wilmington; Lewis A. Lukens, New York.

Contracts for gun forgings have been awarded at the Navy Department to the Bethlehem Iron Co., for six sets of six-inch and 25 sets of five inch, at 26 cents a pound; to the Midvale Co., Philadelphia, 15 sets of four-inch at 25½ cents a pound. These forgings will be brought to the Washington Navy Yard and made into guns for the Hartford and auxiliary cruisers.

W. S. Rockwell & Co., New York, have recently supplied the John B. Rheil Co., Philadelphia, with one of their oil brazing plants for brazing tubing.

At Butler, Ind., the Auburn Foundry & Machine Works made an assignment.

The Walker Co., Cleveland, has lately secured through its German agent, the contract for supplying the machinery and building street railways at Seignitz, Silesia, and Fiurne, Austria.

At Bangor, Me., the following bids were presented to the water board for 16 head gates and 16 side hoists: R. D. Wood & Co., Philadelphia, Pa., $14,440; Coulter-McKenzie, Machine Co., Bridgeport, Conn., $19,600; Aetna Foundry & Machine Co., Warren, O., (accepted) $5,457; Coldwell-Wilcox Co., Newburgh, N. Y., $10,733; Geo. C. Howard, Philadelphia, Pa., $11,778; Holyoke Machine Co., Worcester, Mass., $6,650; Bangor Foundry & Machine Co., Bangor, Me., $7,769; Portland Co., Portland, Me., $6,375; Hinckley & Egery Iron Co., Bangor, Me., $8,938; Stilwell-Bierce & Smith-Vaile Co., Dayton, O., $10,090; Dayton Globe Iron Works Co., Dayton, O., $9,535; The Dickson Mfg. Co., Scranton, Pa., $10,660; S. Morgan Smith Co., York, Pa., $9,400.

The Belfont Iron Works started its puddling and nail mills at Ironton, O., this week. The Kelly nail mill at the same place is in full operation, as well as the Ironton Rolling Mill. Sarah Furnace is in blast and Belfont is ready to go in.

A lodge of the Amalgamated Association has been organized at Muncie, Ind., among employees of the Muncie Iron Works.

At Akron, O., John F. Seiberling, formerly president of the J. F. Seiberling & Co., mower and reaper manufacturers, who failed two years ago, made a personal assignment Aug. 21. His endorsements for the company led to the step.

We are advised by the New Jersey & Pennsylvania Concentrating Works, of which Thomas A. Edison is president, that he has no connection with the plant which the dispatches reported was being erected at West Portal, N. J., for the concentration of iron ore.

At the mills of Jones & Laughlins, Ltd., Pittsburg, there is trouble over the compensation of roughers in mills Nos. 9 and 10, the latter insisting that they be paid on a basis of seven and a half per cent, instead of 15 per cent below the old scale; in other words, on the basis of the Youngstown settlement. Four rollers refused to obey the Amalgamated Association order to come out, and thus far neither the company nor the rollers have been willing to make up the seven and a half per cent asked by the roughers. The head rollers are getting other men and the mills are run in part.

The universal and 65-inch mills at Pottstown, Pa., have been put in operation by Geo. B. Lessig, the wage questions in dispute being compromised. The Glasgow Iron Co. has taken several orders and will start its valley mill, which has been idle a long time.

The McCool Tube Co., of Beaver Falls, has received an order from Milwaukee for 1,000,000 feet of tubing.

A steel bridge plate 88 feet long was rolled at the universal mill of the Central Iron & Steel Co., at Harrisburg, recently. The plate required three cars to carry it.

The Leechburg Foundry & Machine Co., of Pittsburg, has a contract from the Crescent Sheet & Tin Plate Co., of Cleveland, for two 24-inch mills, squaring and doubling shears.

The Pennsylvania Steel Co.'s slab mill at Steelton, has been put on day and night work on large orders for slabs. The improvements of its No. 2 blooming mill are completed and it has orders which will keep it busy for several weeks. Nearly all departments, particularly the rail mills, are busy. Three furances are in blast.

R. D. Wood & Co.'s foundry, at Millville, N. J., is making an experimental order of pipes for electrical subways, with a chance of getting a contract for 10,000 tons of this pipe.

For the first time since 1892 all departments of Moorhead Bros. & Co.'s plant at Sharpsburg, are in full operation. In some departments double turns are made.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

To Winona Assembly Grounds, Eagle Lake (near Warsaw, Ind.), May 15th to August 31st, for Annual Assembly and Summer School.

To Indianapolis, September 8th and 9th, for National Encampment Sons of Veterans.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

Merchants' Excursion to New York and Philadelphia.

On August 27th, 28th, 29th, 30th and 31st the Pennsylvania Lines will have cheap excursions to New York and Philadelphia for merchants. For praticulars apply to nearest Pennsylvania Line ticket agent, or address C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

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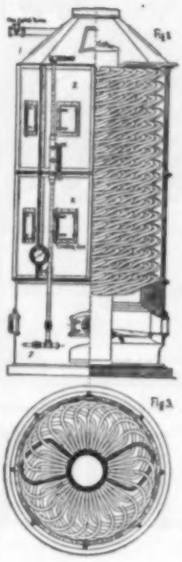

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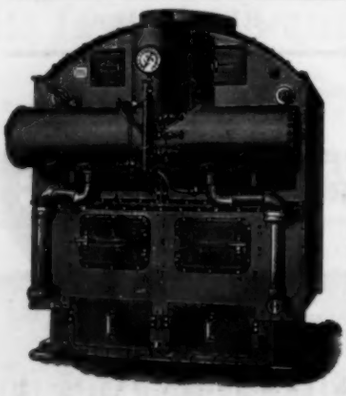

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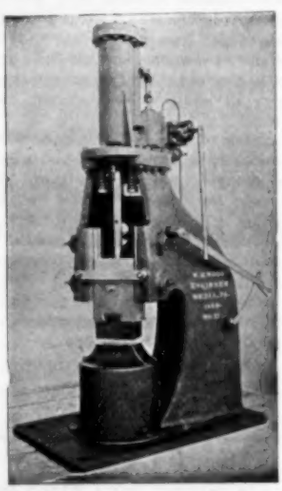

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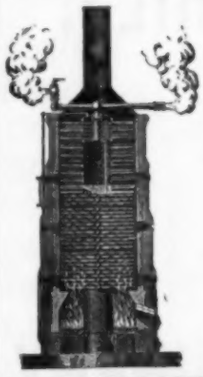

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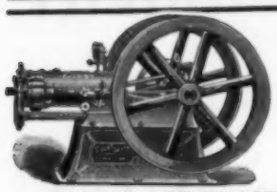

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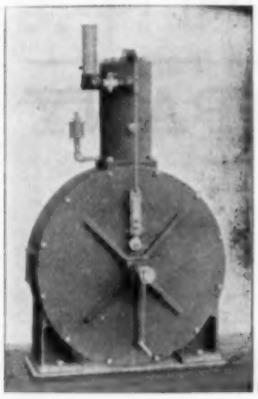

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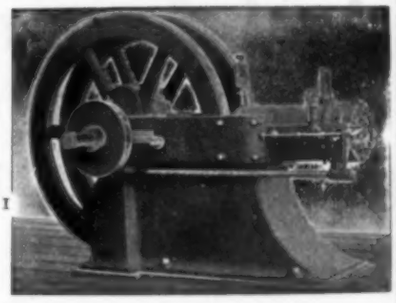

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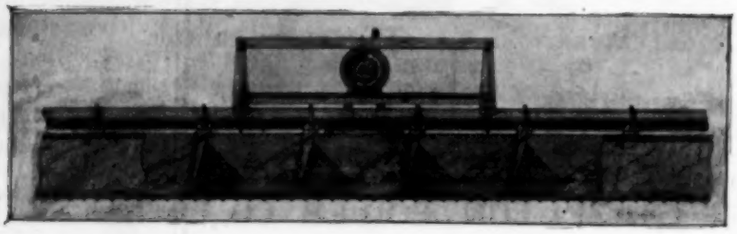

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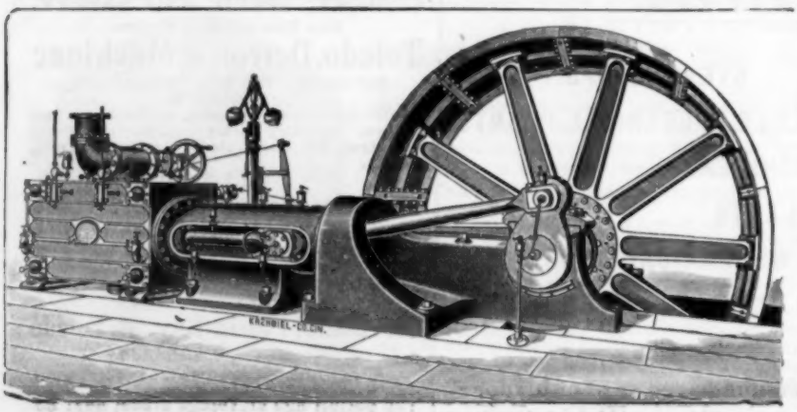

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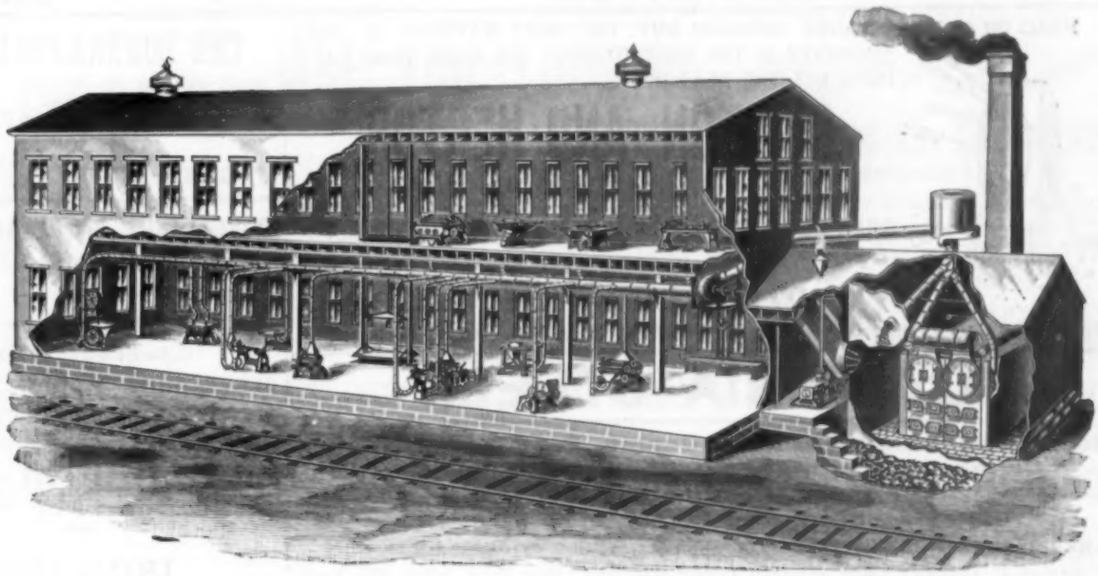

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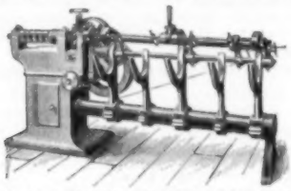

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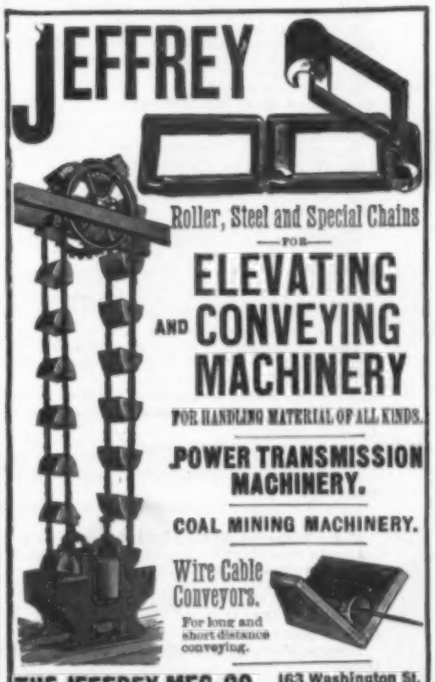

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Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.

Motors—
Westinghouse, Church, Kerr & Co., New York City.
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.
Card Electric Co., Mansfield, O.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Jackson Sand Mining Co., Jackson, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
The Lunkenheimer Co., Cincinnati, O.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Gates Iron Works, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Allen Anti-Rust Mfg. Co., Cincinnati, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Phosphor Bronze Castings—
Nolte Brass Co., Springfield, O.
Lorain Foundry Co., Lorain, O.

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.
Clinton Iron & Steel Co., Pittsburg.
Worster Waterbury & Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Bourne-Fuller Co. Cleveland, O.
J. Wesley Pullman Philadelphia Pa.
M. A. Hanna & Co., Cleveland, O.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Pipe
W. H. Bosworth, Cleveland, O.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Polishing Machines—
Diamond Machine Co., Providence, R. I.

Portable Forges—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Power Presses—
Long & Allstattar Co., Hamilton, O.
Perkins Machine Co., Boston, Mass.

Power Transmission Machinery—
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Long & Allstatter Co., Hamilton, O.
Perkins Machine Co., Boston, Mass.

Pressure Reducing Valves—
W. H. Bosworth, Cleveland, O.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
The Edward P. Allis Co., Milwaukee, Wis.
Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Radial Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Riveting Machinery—
Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Roofs—
Shiffler Bridge Co., Pittsburg.

Roofing Paint—
Allen Anti-Rust Mfg. Co., Cincinnati, O.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Screws—
C. H. Besly & Co., Chicago Ill.
Upson Nut Co., Cleveland, O
Chicago Screw Co., Chicago, Ill.

Semi-Steel—
The King & Andrews Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City Ind.
Toledo Machine & Tool Co., Toledo, O.
Wm. H Wood, Media, Pa
Long & Allstatter Co, Hamilton, O.
Perkins Machine Co., Boston, Mass.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O
Edwin Harrington Son & Co., Philadelphia.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O
Marion Steam Shovel Co., Marion, O.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Pittsburg Tool Steel Co., Pittsburg, Pa.
Otis Steel Co., Cleveland, O.

Steel Castings—
The Sargent Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O.
The King & Andrews Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland
Bethlehem Iron Co., South Bethlehem,
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Ficharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., New York City.

Tanks—
Enterprise Boiler Co., Youngstown, O
Meehan Boiler & Construction Co., Lowellville, Ohio.

Tinning Machinery—
W. H. Bosworth, Cleveland, O.
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Pittsburg Tool Steel Co., Pittsburg, Pa.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Tube Welding—
S. Fix Sons, Cleveland.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
W. H. Bosworth, Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

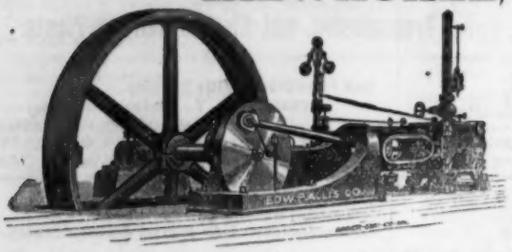
Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Wire Machinery—
John Adt & Son New Haven Conn.
Turner, Vaughn & Taylor Co, Cuyahoga Falls, Ohio.
Wm. Glader, Chicago, Ill.

Wire Nail Machinery—
Wm. Glader, Chicago, Ill.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



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NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO PITTSBURG.

The A B C of Iron.—A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron. CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to Reduce Cost of Mixture. Steel. Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron. Former price $2.00, NOW $1.00. Order of *The Iron Trade Review Co.*, 27 Vincent St., Cleveland, O.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@ 3 46
No. 1 Specular, Bessemer	3.05@ 3.17
No. 1 Bessemer hematite	2.60@ 2.90
Hematites No. 1 non-Bessemer	2.00@ 2.25
No 1. Specular, non-Bessemer	2.40@ 2 60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 90@ 10 15
No. 1 Strong Foundry	10 25@ 10 65
No. 2 Strong Foundry	9 50@ 10 00
No. 1 Gray Forge, red short	8 65
No. 2 Gray Forge, neutral	8 75
No. 1 American Scotch	10 40
No. 2 American Scotch	10 15
Lake Superior Charcoal	12 75@ 13 00
PITTSBURG:	
No. 1 Foundry	$10 25@ 10 50
No. 2 Foundry	9 25@ 9 65
Gray Forge	8 25@ 8 75
White and Mottled	8 50
Warm Blast Charcoal	14 50@ 15 00
Cold Blast Charcoal	17 00
Bessemer	9.40@ 9 50
CHICAGO:	
Lake Superior Charcoal	$13 00@$13 25
Local Coke Foundry No. 1	10 25@ 10 75
Local Coke Foundry No. 2	10 25@ 10 50
Local Coke Foundry No. 3	10 00@ 10 25
Local Scotch Foundry No. 1	10 50@ 10 75
Local Scotch Foundry No. 2	10 25@ 10 50
Local Scotch Foundry No. 3	10 00@ 10 25
Southern Coke No. 1	10 75@ 11 00
Southern Coke No. 2	9 85@ 10 10
Southern Coke No. 3	9 60@ 9 85
Southern No. 1 Soft	10 35@ 10 60
Southern No. 2 Soft	9 85@ 10 35
Southern Silveries	10 35@ 10 60
Jackson Co. Silveries	12 50@ 14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@ 12 25
Alabama Car Wheel	16 50@ 16 00
Malleable Bessemer	10 75@ 11 00
Coke Bessemer	11 50@ 12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 75@10 00
Southern Coke No. 2 and No 1 Soft	9 00@ 9 25
Hanging Rock Coke, No 1	12 50@ 13 00
Hanging Rock Charcoal No. 1, Fdy	14 50@ 15 50
Tennessee Charcoal No 1	12 50@ 13 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 00@ 8 25
" " Mottled	8 25@ 8 50
Standard Georgia Car Wheel	14 25@ 15 00
Tennessee " "	13 00@ 14 00
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	10 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 00
Ohio Strong Softener No. 1	10 50
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	14 00
Southern Soft No. 1	10 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$12 00
Old steel rails (6 ft. and over)	10 00
Old steel rails (6 ft. and under)	9 00
Old car wheels	9 25
	NET TONS
No. 1 R. R. wrought scrap	$ 9 75
Mill scrap	7 25
No. 1 Machine cast scrap	8 00
Iron axles	13 25
Axle turnings	7 50
Wrought turnings (free from cast)	5 50
Cast borings	4 50
Uncut wrought iron boilers	3 50
Steel boiler plates	7 00
Grate bars	5 25
Pipes and flues (clean)	6 50
Tank iron	7 00
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	5 25
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.05c
Tees	1.15c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.00 Base
2 to 2⅞	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6¼ to 6½	2.20 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

We Claim The Following Merits for Jenkins Bros.' Valves

1. Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
6. ALL GENUINE stamped with Trade Mark.

(2)

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

THE JACKSON SAND MINING CO.,

JACKSON, O.

Producers of SILICA, FIRE and CORE SAND. Also MOLDING SAND for STEEL CASTINGS. Write for Prices.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

Not every insertion of every advertiser's card brings an order for the advertiser's good; no more does every visit of the traveling salesman result in a sale.

There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a "busy day's" courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¼	2.50 extra.
¾ to ⅞	.10 "
⅞ to 11-16	.30 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1⅝ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
⅞ to 15-16 x ⅜ to ⅝	.40 "
⅞ to 11-16 x ⅜ to ⅝	.50 "
⅞ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅞ to 11-16 x ¼ to 5-16	.80 "
⅝ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge shaft iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¾ to 4 x No. 9 to 3-16	.40 "
1¾ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅜ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes .1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base.
		Extras.
1⅛ to 6,	" 10, 11, 12 or 1/4"	.05 per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or 1/4"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 1/4"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or 1/4"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or 1/4"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or 1/4"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-16	" 10, 11, 12 or 1/4"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or 1/4"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15
1 7-16 to 1⅝,	" 22	.25
1 ⅜ to 1⅝,	" 13, 14 and 15	.05
1⅜ to 1⅝	" 16, 17 and 18	.10

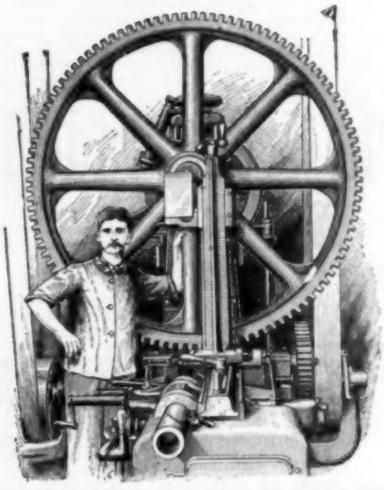
F. A. ESTEP, Pres. & Treas. J. R. McGINLEY, Vice Pres't. THOS. FAWCUS, Supt.

Watch the Little Indicator When the Wheel Stops

and you will see that it points accurately to where the next tooth is to be cut. It is this accuracy that makes

CUT GEARS

Economical of power and long lived.



R. D. NUTTALL CO.,

99 Boquet St.,

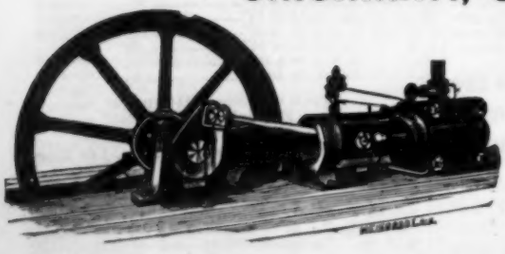
Write us. ALLECHENY, PA.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
7/16,	"	13, 14 and 15	1.00 "
7/16,	"	16, 17 and 18	1.10 "
7/16,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

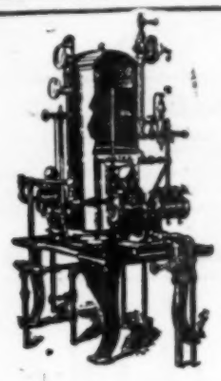
The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



IMPROVED DUPLEX SYSTEM
- - - FOR - - -
BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

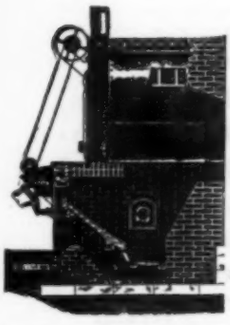
Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats. cts. lbs.

2 to 9-16 in. wide by 2 to ⅝ thick .08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON. cts. lbs.

1 to 2 in. inclusive	.08
9-16 to ⅛ in. "	.08
7-16 to ⅜ and 2¾ to 3 in	.09
3¼ to 4 in	.09½
⅜ to 11-16 and 4½	.10
⅛ to 6 in	.10½
¼ to 9-32 and 6¼ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 co
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four ins				.62
Butt	"	"	four ins	.62½
Lap	" galv.	"	four ins	.52½
Butt	"	"	four ins	.50
Boiler tubes 2¾" and smaller				.70
Boiler tubes 2¾" and larger				.75
Casting screw and socket joint				dis. 52½
Casing inserted joint				dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti Friction Metal, 25 cts. per lb. f. o. b New York or Chicago.
No Name Metal, 18 cts. per lb., f. o. b. New York or Chicago.
Mystic Metal. 8 cts. per lb., f. o. b. New York or Chicago.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard		dis 10 & 10
" " "	extra	dis 60&10
" " "	best	dis 55
Cleveland Rubber Co. extra standard		dis 60&10
Hoyt's Short Lap		dis 50
Shultz Raw Hide Leather Belting, single		dis 40
Munson's Short Lap Single Leather		dis 50
Munson's Short Lap Double and Light Double Leather		dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double		dis 40
Standard, oak tanned		dis 50&10
Alexander Brothers' pure oak tanned		dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent		dis 45
"	Combination	dis 40
"	Geared Scroll	dis 80
"	2 Jaw Brass Workers	dis 30
"	Drill	dis 35
Wescott's Scroll Combination		dis 33⅓
"	Independent	dis 40
"	Little Giant Drill	dis 33⅓
Horton's Independent		dis 45
Whiton's Independent		dis 45
National Combination		dis 45
Sweetland "		dis 40
Almond Drill		dis 40
Morse "		dis 20
Skinner's Combination Lathe		dis 40&15
"	Independent Lathe	dis 40&10
"	Universal Lathe	dis 40&10
"	Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills
Morse Taper&Straight Shank to 1¼" dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1¼" dis 25
Drill Sockets dis 25
Standard Twist Drills dis 60@60&5
Cleveland " " dis 60@60&5

Emery.

	No. 4 to No. 54	150 gr.	to Flour, C. F
	46 gr.		F. F
Kegs, ℔ lb	4½c	5 c	2½c
½ kegs ℔ lb	4½c	5½c	2½c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Crant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 10c
" " " " over 5 lbs. 8c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¾	3⅛
Hexagon	15¾	11⅛	8½	6	5¾	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ℔ keg, base.
Car lots $1 30
Less than car lots $1 40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz. ..... dis 10@10&10

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in. ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in. ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

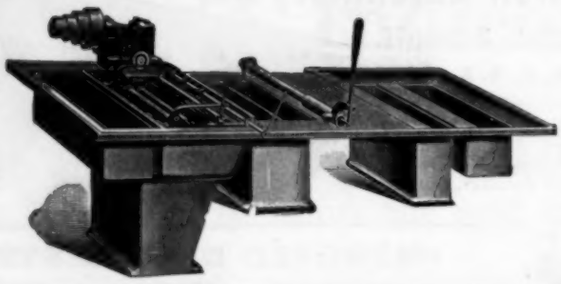
New List, Apr. 9, 1894

Brass ..... dis 35c
Copper ..... dis 35c
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

FOR
ARTISTIC
PRINTING
WRITE
THE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND, O.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY.



Rolling Mills, Sand and Chill ROLLS.

WORLD'S FAIR AWARD.

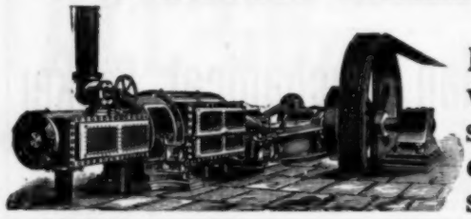
We are the only Steel Roofing Co. awarded Medal and Diploma for PATENT CAP ROOFING at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., • Chicago and Niles, O.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



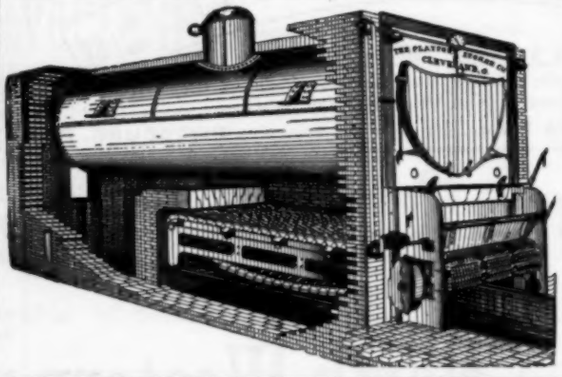
Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y. E. F. WILLIAMS.

Fark Building, Pittsburg, SEWARD S. BABBITT.



The Playford Mechanical Stoker

Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.,

No. 61 Case Library Bldg.,

CLEVELAND, O.

LUNKENHEIMER'S

FIRE ALARM

WHISTLE

is unsurpassed as a signal or fire alarm whistle. Practical in construction and easily operated.

Made in the following sizes: 2½-, 3½-, 5 and 8 inches diameter of bell.

Thousands of satisfied users.

Specify Lunkenheimer make and you will be satisfied.

Catalogue free upon request.

THE LUNKENHEIMER COMPANY,

Cincinnati, Ohio, U. S. A.

SOLE MANUFACTURERS.

26 Cortlandt St., NEW YORK. } BRANCHES { 35 Great Dover St., LONDON, S. E.

BELT DRIVEN
DIRECT DRIVEN
DYNAMOS AND MOTORS
SLOW SPEED
HIGH GRADE

THE CARD ELECTRIC CO.
MANSFIELD, OHIO, U.S.A.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
T. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

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J. E. WOLCOTT, Special Agent, Room 32, Wilshire Bldg., Cleveland, O.

CLEVELAND ELECTROTYPE CO.
ELECTROTYPING ENGRAVING AND STEREOTYPING.
50 HIGH ST. — TEL. 2139.

ESTABLISHED 1854.
PETER GERLACH & CO.,
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland, Ohio, U. S. A.

THE BETHLEHEM IRON CO.,
WORKS AND PRINCIPAL OFFICE,
SOUTH BETHLEHEM, PENNA.

RAILS, BILLETS, MUCK BARS.

FORGINGS of all descriptions, either Solid or Hollow, made from Fluid-Compressed, Hydraulic Forged Open Hearth Steel.
PLATES for all purposes..

NEW YORK OFFICE, 100 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.
CHICAGO OFFICE, MARQUETTE BUILDING.

PERKINS POWER PRESSES
New Styles, Eccentric Motion,
Instantaneous Clutch,
POSITIVE WORK.
WE RESPECTFULLY SOLICIT YOUR PATRONAGE.
Perkins Machine Co.
Factory and Office: K and East 1st Sts., South Boston, Mass.

No. 3 Power Press

TOLEDO MACHINE & TOOL CO.,
501-505 Superior St., Toledo Ohio.
We manufacture
Power Punches. Forging Presses.
Power Presses. Trimming Presses.
Straight Sided Double Pitman Presses.
Drop Presses.
Embossing Presses. Automatic Feed Presses.
Stamping Presses. Power Slitting Machines.
Riveting Machines. Power Shears.
Special and Automatic Machinery Dies for all classes of work in sheet metals.
Write for catalogue and prices.

No. 25 Power Press

THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO., Limited,
Office and Works at CLEARFIELD, PA.
Room 305 Ferguson Bldg., Pittsburg, Pa., John Richardson, Agent.

KING'S SIX TON ELECTRIC CRANE
Can be furnished at low cost.
Write for full information to the MARION STEAM SHOVEL CO Marion, Ohio.

B. P. CRANE & CO.
TIN & TERNE PLATES
L. D. Telephone, MAIN 841. 205 LA SALLE ST.
CHICAGO.

FIRE DOVER FIRE BRICK CO., BRICK
MANUFACTURERS OF
Furnace, Mill and Special Shape Fire Brick.
Office, 44 Mercantile Bank Bldg.,
CLEVELAND, OHIO.

THE

VELLMAN,

SEAVER

ENGINEERING CO.,

1405

ew England Bldg.,

CLEVELAND, O.

ENGINEERS

AND

CONTRACTORS.

Entire availability of yard room and cheapness of construction are among the advantages of this crane.

200 ft. span.

ELECTRIC

GANTRY

CRANE

built for

CAMBRIA IRON CO.

Johnstown, Pa.

Write us for further description. We can build these cranes in whatever size and capacity may best suit your purpose.

THE HART OR DETROIT

Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,

District Manager, No. 911 Chicago Opera House Block, Chicago, Ill., or Box 84, Columbus, O

☞ N. B.—Also Agent for WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

THE HARRINGTON & KING PERFORATING CO. CHICAGO.

METALS PERFORATED AS REQUIRED FOR

SCREENS OF ALL KINDS

AND FOR USE IN

Milling and Mining Machinery
Reduction and Concentrating Works
Woolen, Cotton, Paper and Pulp Mills
Rice, Flour and Cottonseed Oil Mills
Sugar and Malt Houses
Distilleries, Filter Presses
Stone, Coal and Ore Screens
Stamp Battery Screens
Brick and Tile Works, Filters
Spark Arresters, Gas and Water Works
Oil, Gas and Vapor Stoves
Coffee Machinery, etc., etc.

Standard Sizes Perforated Tin and Brass Always in Stock.

Main Office and Works: 226 North Union Street, Chicago, Ill., U.S.A.

Eastern Office: No. 284 Pearl Street, New York.

MEEHAN BOILER & CONSTRUCTION CO.,

LOWELLVILLE, OHIO,

MANUFACTURERS OF

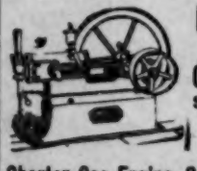
MEEHAN'S COMBINED SAFETY and WATER TUBE BOILER.

All kinds of Blast Furnace, Steel Plants and Stand Pipe Work.

Also all kinds of Oil Refinery and Tank Work.

WROUGHT IRON WELDED and RIVETED ANNEALING BOXES.

Structural and Engineering Work



FARMERS

are appreciating the

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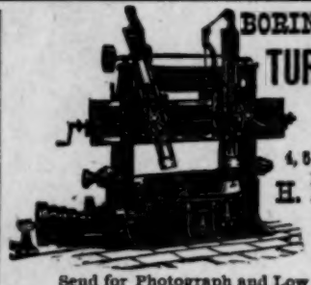

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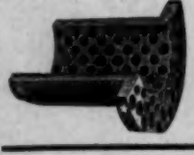

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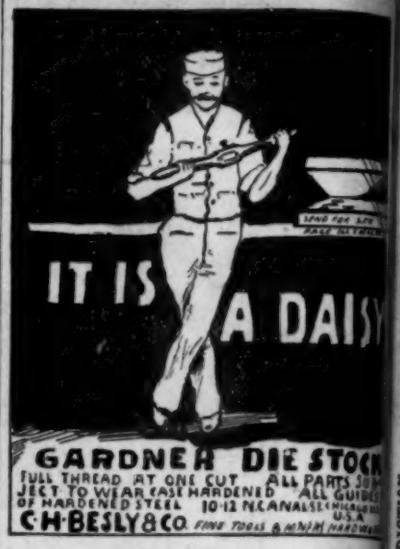

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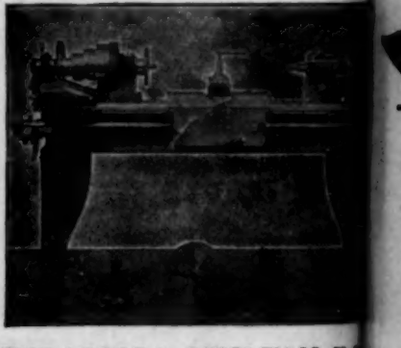

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